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The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Managing Editor* SID NOBLE, *Editor*

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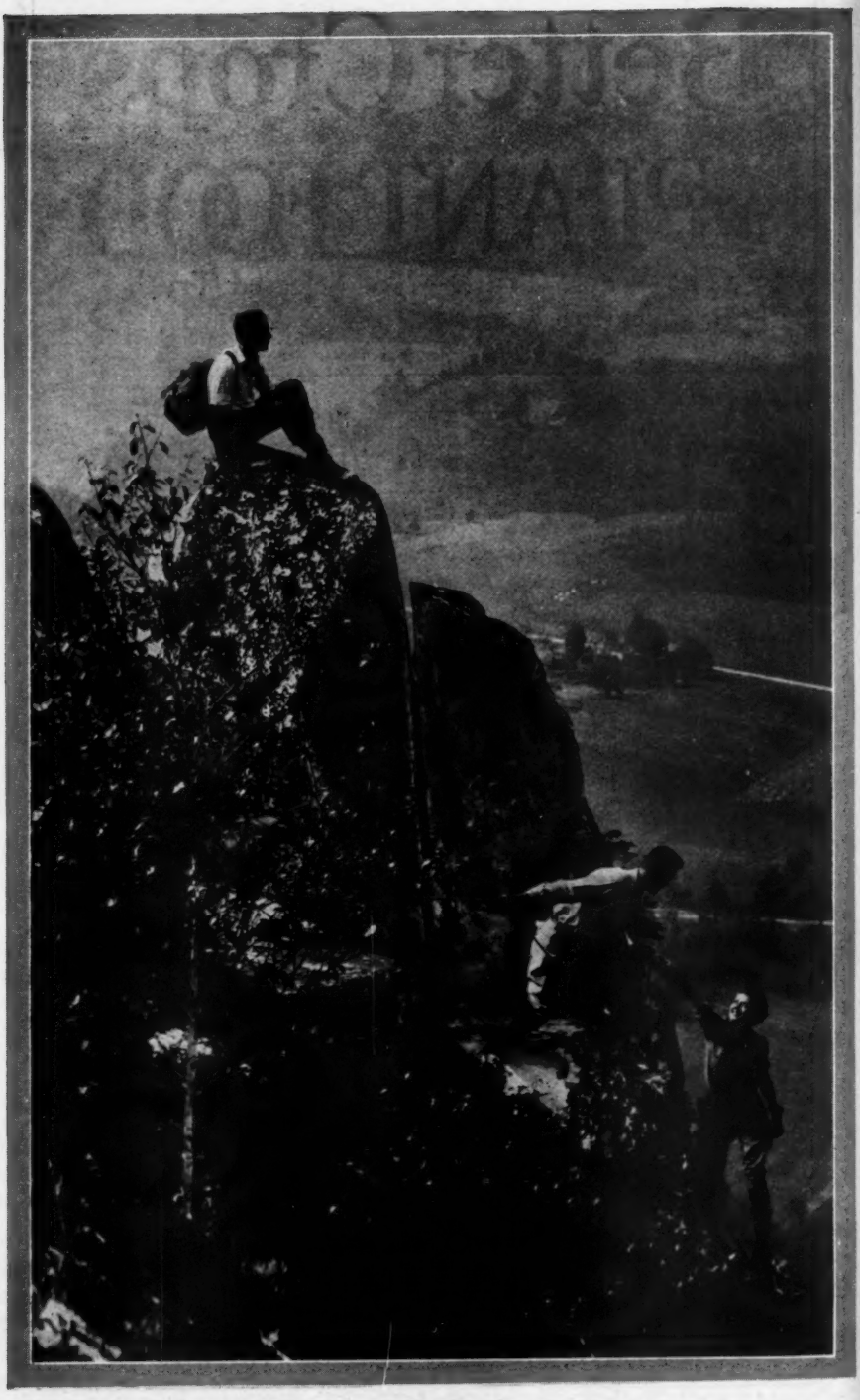

ON TOP!

Better Crops with PLANT FOOD

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VOL. XV NEW YORK, AUGUST, 1930 No. 2

Summer is the open season for—

Picnics

By Jeff McDermid

"I'LL pack a picnic lunch; meet us at the zoo," phones my wife. I am strong for the former but lukewarm over the latter. With a clamoring family of youngsters and myself included, I cannot see why we need to go away from home to see monkeys and a bear. But all I am required to do is to bring my appetite and the price of a few cones.

I understand the origin of the word "picnic" is rather uncertain. It comes partly from the French, "picqueneque," but we can be thankful it is shorter in this country. The official definition of it says it is a "pleasure party" in which the members partake of food provided in common and usually eaten in the open air. If I had written the dictionary I might have put in a few more qualifying phrases close to the "pleasure" commentary, but on the whole I have only mild thoughts for this popular diversion.

I have a friend who is a statistician and comes from Baltimore. There are two things he hates—mathematical errors and picnics. He enjoys Lady Baltimore cake and lobster patties, but

prefers his dessert on a linen-covered table and his sea-food in solitude. Just to get him excited I have taken the side of the picnic in various altercations. I have even invited him to dinner and laid the cloth out in our herbarium in the back yard. In fact I have flaunted his pet aversion on every chance opportunity. Finally I made him admit that he patronized the Lexington Street Market in his glorious Maryland city—and that is one gigantic outdoor food festival if there ever was one. But he answered that when dirt is visible and its volume can be estimated and tabulated, one can buy in inverse ratio and not be dissappointed with local color and such things. But when one expects a perfectly fine home-made meal and gets there a few minutes after the ice has melted and the ants have expired in it, he says the effect is harmful in hot weather to men of temperament.

GRANTING that my friend represents a vast body of the anti-picnic party in America, it behooves me to limit the true definition of a picnic to "food partaken in the open air." The word "pleasure" must perforce be left out if we are to reach a common agreement. Probably it would be just as unfair to tack "pleasure" on a definition of cigarettes or chewing tobacco, despite the fact that a goodly portion of our fair sex have discriminated enough to adopt the former. I trust their liberal tendencies will go no further in that direction.

I have lived close to the noble redskin in my youth. I have lived with him on his reservations and accepted him in the same manner. Indians are stoical and solemn. Why? Because they never have picnics. They have never had to have them. They never hope to have them. They have lived close to the zoo all their lives and their squaws know the art of mixing hickory smoke and dog soup so that you couldn't taste the leaf hoppers in the mixture if you tried. Humanity wants a treat when it goes on a picnic and the only way you can treat an Indian is against the law nowadays. So if we depend on picnics to recast the stolid countenances of our original brothers into the carefree and zestful miens of the adopted Americans we shall wait longer than for farm relief. All of which goes to show how unjust it is to limit the definition of a picnic to "food partaken in the open air."

Yet on the other hand I have my Baltimore opponent fast. I shall not leave the reservation to clinch it either. If the sons of Sitting Bull and Rain in the Face have withstood so many outdoor gastronomic bouts without being entirely devastated, with Yankee liquor and the Department of the Interior on top of it, why in the name of Fanny Farmer can't we try a little ourselves? (Picnics, not liquor.)

I have wondered for some time who brought the first picnic to America. Those who came in the Mayflower had none with them, for the Bradfords and Brewsters preferred to save up all their hilarity for the Boston tea party. It wasn't the Jamestown colony, for they couldn't have agreed on a menu. It wasn't Oglethorpe's Georgians, for they didn't have the price of paper plates. It was too peaceful for the Irish and too wasteful for the Scots. I am satisfied from my own knowledge of antecedants and appetites that the picnic was imported by Norwegians and Germans. Ludefisk and wiener wurst taste equally powerful indoors or out. Should we ever determine the real author of the first American picnic we shall send out a subscription sheet to erect a monument in his honor. It will be higher and nobler than the one Sidney Smith built to immortalize Andy Gump at Lake Geneva.

Its base shall be sandwiches and layer cake done in marble and granite, surmounted by a human figure wearing a necklace of frankfurts and bearing aloft a trident on which are speared three golden marshmallows.

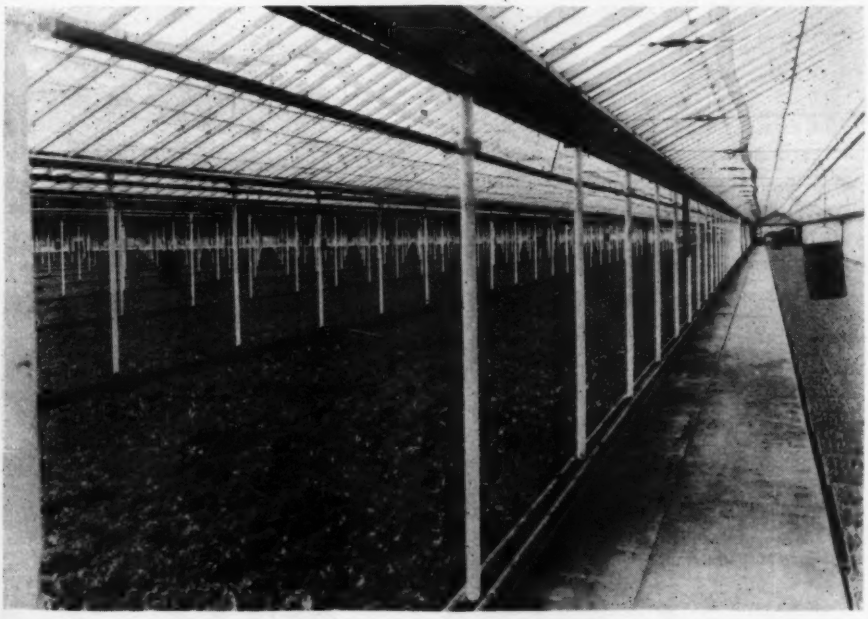
(*Turn to page* 61)

Growing vegetables the greenhouse way

Under Glass

By E. R. Lancashire

Ohio State University



A lettuce crop, nearly mature, under glass.

PERHAPS the first vegetable to be grown the greenhouse way was lettuce. The records show that as early as 1880 at least one grower in or near Boston, Massachusetts, was producing lettuce in glass-covered houses. The business grew and spread. Grand Rapids, Michigan, Toledo and Cleveland, Ohio, and places in New York and Philadelphia learned to produce vegetables the greenhouse way. At the present time large acreages, covered with glass, are found producing tomatoes, cucumbers, lettuce, and minor crops in nearly all sections of the United States. In Ohio alone

there are some 600 acres of such farming.

This growing business is in a state of continual change from the old to the newer methods of production and marketing. It has been stated that there is an art and a science to the business of agriculture. The two are clearly illustrated in the greenhouse way of growing vegetables. The art of growing tomatoes and cucumbers under glass or the greenhouse way has been handed down from one man to another until certain practices became well established. This well-established art of growing cucumbers and tomatoes called for the application of a heavy organic mulch to the surface of the soil. This practice was very common around Cleveland until some two years ago.

A change has taken place since then. A scientist, Professor I. C. Hoffman, from Ohio's Agricultural Experiment Station, became interested and in checking up the methods used in producing vegetables under glass, he found that the art of using a manure mulch or other form of organic mulch was a good way to reduce the yield of tomatoes and cucumbers. The science of agriculture has been in process of development some 300 years whereas the art of agriculture has been in operation since the days of the Garden of Eden. It is small wonder that changes found profitable by the scientific farmer have been adopted rather slowly by the tiller of the soil who has been thoroughly trained in the art of agriculture.

Soil covered the modern greenhouse way costs about one dollar a square foot or approximately $50,000 per acre. The costly overhead charges on such a system of farming make it practical to investigate each new contribution of the science of agriculture. More and more science and less and less art of agriculture are used by the successful greenhouse grower.

The first classic experiment, now some 300 years old, was not as especially fruitful of practical and profitable results as are some of the more modern ones. Yet it was man's first

Interior view of a packing shed.

How greenhouse soil is plowed.

attempt to break away from the art of agriculture. In this first search for truth Johan Baptista took an earthen vessel in which he placed 200 pounds of soil dried in an oven. This soil was moistened with rain water and in it he planted a shoot of willow weighing five pounds. After exactly five years the tree weighed 169 pounds and about three ounces. During this time nothing but water was added to the soil. Yet when the soil was weighed again it had lost only two ounces. The conclusion was that the 164 pounds and 1 ounce of wood, bark, and root system arose from the water alone.

Controlled Conditions

Since that time man has learned many secrets of the mysterious way in which a plant lives and grows. The observing grower can so control the water supply, the management of the soil, the temperature, the supply of plant food in the soil, as well as other factors, that maximum yields of high quality vegetables are possible. Nowhere is this control by man as complete as in a modern greenhouse.

Conditions in a greenhouse are under the control of the operator. He can ventilate or close the house. The soil can be sterilized and the same system of tile used for this work can be utilized to sub-irrigate the soil. Excess soluble salts present in the soil can be washed out through this tile system. It is also possible to control the amount of light, but at the present time the methods available are too costly. The temperature can be raised or lowered at will. The original soil can be completely changed through the addition of organic and inorganic fertilizers.

The scientist works best under just such controlled conditions. Recently, the Ohio Agricultural Experiment Station proved that a spring crop of tomatoes could be grown as desired, smooth or rough. All one needs to do is to control the temperature, regulate the water supply, and balance the amounts of nitrogen, phosphorus, and potassium to meet the changing needs of the tomato plant. By varying these factors a smooth or rough tomato is

produced almost as readily as a wheelsman steers his ship. A turn or two extra on the water, too much or too little heat, or nitrogen in excess in the early life of a tomato plant or too little nitrogen during the bearing stage and the result would be an unsatisfactory crop of poor quality, rough tomatoes.

The science of agriculture has been busy with the greenhouse cucumber crop also. A nubbin is a cucumber that grew too slowly. The fancy market has little use for nubbins and so their producer is penalized. If every cucumber in every greenhouse was a fancy fruit, there would be little red ink needed even if prices were low. Less nubbins and more fancy fruits are needed.

The number of wasp-shaped cucumbers can sometimes be reduced. Such a cucumber may be the result of an interrupted growth. A fancy cucumber can be produced from 14 to 20 days after a cucumber is pollinated. If the pollination is not accomplished promptly, wasplike cucumbers develop. A good deal can be done with fertilizers to fill out the wasplike lines of such fruit, and many of them can be improved so as to grade number one in place of number two.

Regulation of the water supply is needed especially during the early growth of the cucumber crop. During the short, cloudy days of early January to March, watering the cucumber crop is easily over-done, especially when the soil drainage is none too good.

The greenhouse lettuce crop grows with as little help from the grower as any crop, yet in this field the contributions of science are invaluable. Feeding the lettuce crop, watering the plants, and improving the varietal strains are all favorite studies of the scientist.

Tile drainage, sterilization, and subirrigation systems for greenhouse soils can all be combined in one. The four-inch drainage tile are laid in lines 16 inches from center to center and from 13 to 18 inches from the surface of the soil to the bottom of the trench in which they are placed.

For each three to nine square feet of ground area to be sterilized, one horse-power of boiler capacity is required. The lighter the soil the less of it can be treated per horse-power. The shape of the area to be sterilized does not matter. Steam is released in the tile lines through ⅜-inch pipe nipples extending into each line. A steam pressure of at least 50 pounds is used in this work.

The steam is turned into the lines for from three to eight hours. The longer the time, the better the sterilization. All soil to be steamed at one time is first covered with canvas, and this cover remains in place for several hours after the steam is turned off. Soil tempertures of 190° F. at the surface and 160° F. six inches beneath the tile lines and at a point midway between them will give a good control of soil insects and diseases.

Liberates Plant Food

Such treatment of the soil liberates available nitrogen and phosphorus and perhaps potassium. A poor soil may become very productive as a result. If a highly fertile soil is so treated, this additional release of chemicals may result in harmful effects from their over-abundance. Such a condition is referred to as excessive soluble salts. These may be washed out through the tile system. A chemical test is first made to determine whether or not they are present in amounts of more than .26 of one per cent.

While the soil is still warm, from 10 to 12 inches of water will leach out excessive amounts of soluble salts. This method was successful at Warrensville, Ohio, with a soil containing 2.75 per cent of soluble salts.

After this treatment it was found that .44 per cent of soluble salts were retained by the soil. Cucumbers and

(*Turn to page 56*)

Getting Joiners

By G. E. Langdon

Wisconsin College of Agriculture

WHY do some farm families just naturally join rural organizations and others remain "stay-at-homes?" Why are certain districts well organized and others extremely disjointed? Has the traditional isolation and long hours anything to do with keeping some families out of things? Are other families "joiners" and active members of clubs because of some advantage of kind of farming, home conveniences, nearness to town, size of family, or racial aptitude?

Since successful campaigns for better crops and better marketing are based on group action and instruction through farmers' organizations in large part, the why and wherefore of getting people to join is of interest to every agent.

The Wisconsin College of Agriculture has recently made a study of 280 farm families living in five different counties of the State to get a picture of the general scale of living of these families and their relation to such groups as farmers' clubs, farm bureaus, equities, granges, lodges, dramatic societies, boys and girls clubs, and marketing organizations. The members of these 280 families have told their personal experiences with rural organizations to aid in finding out why some districts are well organized and others not.

Careful study of these accounts has finally shown certain definite trends of farm life that differ rather widely from some of the old beliefs about why farmers "joined."

In the first place no community can be judged good or poor from the standpoint of capacity for organiza-

A farmers' picnic for both pleasure and profit.

tion simply on the basis of size and kinds of farms and prosperity of the farm families. Group activity seems to be somewhat independent of the physical and economic conditions under which people live and even of such a social welder as nationality. Neither "border nor creed nor birth" seems to play a great part in uniting farm groups for social purposes.

Those families having greater acreage and better living facilities such as telephones, automobiles and power machinery often did not take as great a part in community life as others less fortunate economically. In other words, the ability of certain farm families to get together and work out mutually beneficial plans for various social clubs and cooperative marketing organizations is not based on what these families have, but on certain more intangible qualities of what they are and what they do.

Farm families seemed to be much more likely to be active in organizations providing they were constant readers of magazines, newspapers, and books, as well as giving liberal amounts of time to listening to radio talks and news. At any rate, the families which gave more time to reading, radio, and other recreation apparently were more likely to take part in rural clubs than other groups which perhaps had the same or additional advantages in the way of home comforts or superior farm business.

Reading absorbs the most time devoted to any one kind of recreation on the farm. In districts where there were many organizations, it was found that 65 per cent of the persons interviewed gave more time to reading than to any other one recreation. The average amount of time spent in reading by persons in highly organized districts was as high as 340 hours a year and about 230 hours in the less organized sections.

At least one daily paper is taken by over 80 per cent of the families which were highly active in organizations and by about 77 per cent of the families which were not very active. The average number of periodicals taken was about six for the first group and five for the others.

The number of books owned and borrowed seems to have a clear relation to organizations because the average number owned by families belonging to many organizations is 70 while for families not interested greatly in rural clubs it is only 24. The average number of books borrowed for reading in a highly organized group is six and only about three in a low group.

Other Forms of Recreation

Interest in the radio seems to be closely tied up with activity in farm societies. Although families in both the low and highly organized groups own radios in about the same proportion of 35 per cent, yet when the actual amount of "listening-in" is measured, it is found that on an average the persons in high groups spend just twice as much time a year in listening to programs as do persons in the low organizations groups. Also, nearly 40 per cent of all the persons in the high groups use the radio, while only about 20 per cent of those in the low groups were interested.

Recreation in such other forms as auto riding, hunting and fishing, dancing, going to the movies, playing cards, and dramatics were enjoyed by both groups that were active in organizations and those that were not. Attendance at movies was highest among farm families that showed a medium interest in organizations.

Almost two-thirds of the persons in the high organization district attended or took part in one or more plays compared with about one-third of the total number of persons in low districts. About four-fifths of the persons in the high districts attended one or more picnics (school, Sunday school, or otherwise) compared with three-fifths of the persons in other districts. About 40 per cent of the

(*Turn to page* 59)

X-rays *for* Plants

By

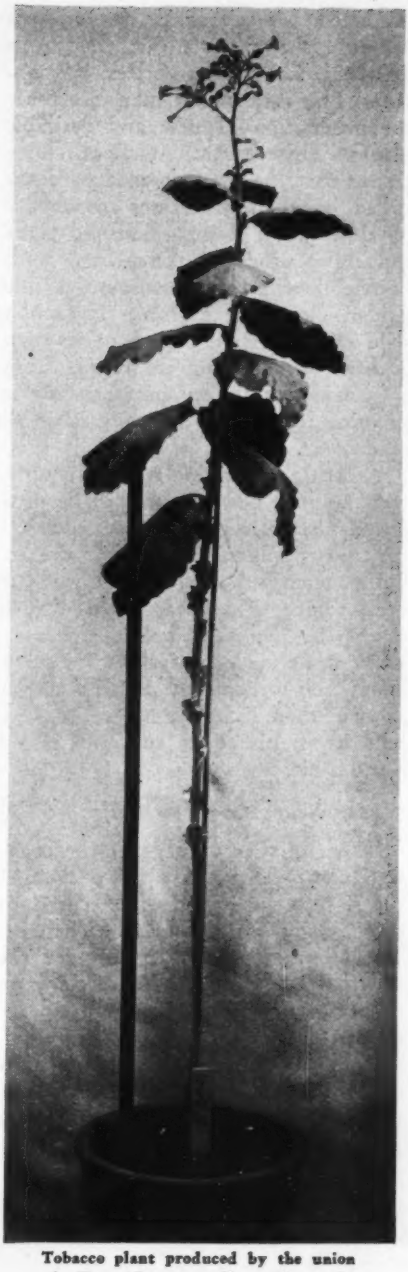
U. V. Wilcox

Washington, D. C.

LUTHER BURBANK, were he alive, would find it possible to greatly stimulate his methods of crop breeding, plant changes, and the production of new varieties by the use of the X-rays. Long and slow changes can be accelerated, new species discovered, and even alterations produced with these powerful rays.

Plant specialists have discovered an entrancing new field of study. T. H. Goodspeed, Professor of Botany, University of California, Miss Edna Louise Johnson of the University of Colorado, Dr. L. F. Stadler of the University of Missouri, and Professor H. J. Muller of the University of Texas are among the scientists who are pioneering in a new field of plant production.

Gardeners and botanists at one time would watch carefully for the "bud sport" or mutation that would make it possible to produce a new variety of plant. It was the event of a decade or generation. Now, however, the X-rays offer opportunity to quickly change the whole life course of the plant that has been given regulated doses of the X-rays. Professor Muller's experiments indicate that evolutionary changes, or mutations, can be



Tobacco plant produced by the union of X-rayed sex cells. Note the greatly increased height and increase in number of leaves (most of them represented only by the remnants of leaf bases).

produced 150 times as fast by the use of the X-rays as they can by the ordinary processes of nature. This means that man can force the production of new and desirable plants. These mutations are the same things that the old-fashioned gardener called "sports". Mutations are what is obtained when a single-flowered plant suddenly produces offspring with double flowers. The common double golden glow, for example, is such a wild mutant; it just came of its own accord, without any invitation from a gardener. Later on some one saw it growing in the field and dug it up to take home.

Assisting or forcing nature in some way, so that new things will be produced faster than at the old rate, has for centuries been the breeders' dream. Until recently, however, there was not even a hint of hope that this dream might be realized, because nobody knew what made mutations. Nobody knew their mechanism. Until that was known, man lacked a handle to take hold of in his effort to push nature along a bit.

Searching for Rules

Then, in the language of the movies, "came the dawn." The arrival of the X-rays showed that the reproductive cells of plants could be changed. The chromosomes or the part of the cell that is responsible for carrying on its peculiar qualities meet with an accident and a new plant is produced. This is the mutation. The basic use of the X-rays for plants merely disturbs the chromosomes and mutations follow. Scientists are now endeavoring to find a rule or rules that will guide in the changes.

Professor Muller began his experiments with the little insect known as the fruit-fly, sometimes called the vinegar-fly and pomace-fly. The advantage lay in the fact that this insect breeds very rapidly, maturing in 21 days, as against 21 years in man, and intermediate times in plants.

The insects were exposed to heavy doses of X-rays and then allowed to breed. Presently the new generation hatched from their eggs. They were less numerous than might have been expected, but otherwise apparently all right. Then Professor Muller bred the first generation offspring and got a second.

Results were immediately apparent. Mutations such as he had often in an un-X-rayed stock turned up, together with a number of brand new ones. He estimates that he produced at least 100 distinct mutations, and that the X-

Three field-grown tobacco plants in progeny from X-rayed seeds. The plant in the center is very large and luxuriant, while the plants on either side are much dwarfed and exhibit many alterations in vegetative and floral characters.

A field grown tobacco plant produced by X-rayed sex cells. Dwarf, compact growth, and great vigor, alterations in size and shape of leaves and in floral characters.

rays speeded up the process over 1,500 per cent. Some of the insects had wings only half size, others no wings at all, still others wings of normal length but abnormally wide or notched at the end or splotched with odd patterns. Instead of their normal dark eyes some of the little flies had white eyes.

The simplest arithmetic will show that if the mutation-producing process can be speeded up even a tenth as much with plants as with the fruit flies, the gain in breeding of new crops, new species, and new flowers will be enormous.

Professor Goodspeed has applied radium salts to tobacco seeds. Taking approximately 250 seeds and placing them in a gelatin capsule such as the druggist uses he inserted the whole in a lead cylinder, on the outer surface of which were fastened the needles containing radium salt. The lead was thick enough to stop all the rays given off but the high speed gamma rays which were allowed to bombard the seeds for various periods of time.

The gamma rays, acting upon the dry tobacco seed, will not kill the embryo unless the dosage is more severe than that applied to human beings. He found, however, that a lesser dosage slowed up the earlier growth of the seedlings.

By allowing the tobacco seed to germinate, a relatively light dosage of the gamma rays will kill many of the developingembryos, and will cause various distortions among ones that survive.

Later Changes May Come

"Even though there may be no striking influence on general growth and vigor of the plants which grow from X-rayed or radiumed seeds or seedlings, later generations from these plants may exhibit definite changes in flower color, flower shape, stature, leaf size, shape, and other growths," Professor Goodspeed said in discussing his work. "Some of the new types in the expression of these plant characters are inherited, persisting without modification in later generations as

produced 150 times as fast by the use of the X-rays as they can by the ordinary processes of nature. This means that man can force the production of new and desirable plants. These mutations are the same things that the old-fashioned gardener called "sports". Mutations are what is obtained when a single-flowered plant suddenly produces offspring with double flowers. The common double golden glow, for example, is such a wild mutant; it just came of its own accord, without any invitation from a gardener. Later on some one saw it growing in the field and dug it up to take home.

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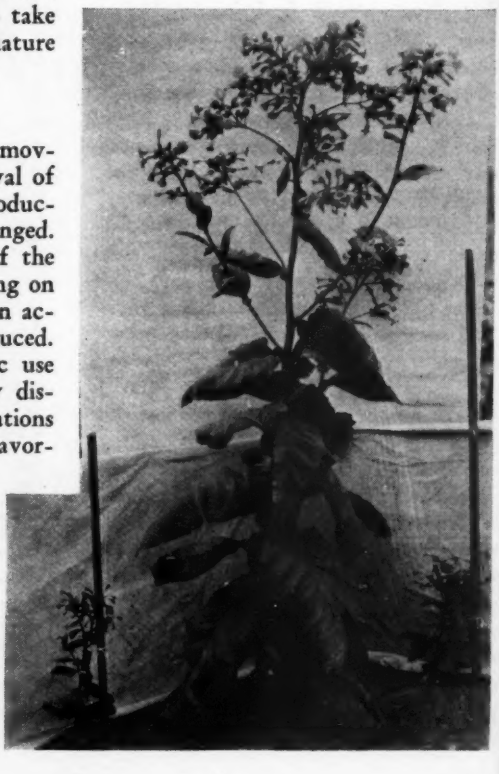

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something new in the species with which the experiment was begun.

"These changes are reflections of vital alterations in the hereditary material carried in the cells. The alterations were produced as a result of absorption of the rays from the X-rays tube or from the radium by the cells at the growing points of the seed or seedling."

Thus again we have the mutations. The powerful unseen rays affect the life courses of the plants as they affect the life courses of the fruit flies and as they undoubtedly would affect larger animals. We know, of course, that the X-rays and the radium rays have immediate and powerful results when applied to human beings.

Professor Goodspeed, who has, perhaps, gone further in his experiments on plants than others, says "Many of the irradiated pollen grains and eggs of the tobacco plant will be capable of normal fertilization, and as a result seeds will be produced from flowers which were given X-rays or radium treatment when they were in the bud stages.

"The plants which grow from these seeds exhibit a bewildering series of changes in any one or in all plant characters, when they are compared with the plant which grow from normal untreated sex cells. If the original parent race of tobacco bears a red flower, these variant plants from X-rays or radium sex cell treatment will show on one plant, perhaps, a light pink, on another a pink, on a third a dark red, on a fourth, a purplish flower color, and so on."

Professor Goodspeed continues: "The surface of the trumpet-shaped flower on some plants will be broader than that of the normal flower borne on the untreated plant, or narrower on other plants. The tube of the flower similarly may be treated and altered in length and there will be plants all of whose flowers are abnormal and distorted.

"The leaves will also be changed in shape and in texture and sometimes the leaf tissues will be rearranged and some of them even inverted. The size and vigor of the whole plant may be strikingly different from that of its untreated relatives. There will be dwarfs and giants, stout telescoped plants, and slender long-branching plants.

Speeding Up Burbank

"Usually a striking change in general appearance is accompanied by changes in all particulars of plant structures, both those which can be seen with the naked eye on the outside of the plant and those which appear only under the microscope in sections of the tissues. Many of these variant plants which grew from seeds that followed the union of X-rayed or radiumed sex cells were partially or completely sterile.

"Many of the variant plants showed under the microscope their origin from treated sex cells because the dividing cells at the apices of the roots or stem exhibited abnormalities in the amount of nuclear material passed on to the new tissues or peculiarities in behavior.

"Such plants became mosaics of hereditary materials and showed differences in the character of the same plant organ on different parts of the one plant body. This may result in important changes in agricultural practices. For, if a treated fruit tree, for example, were in this condition, then side shoots might appear, different in character from normal ones, and either worse or better than the normal changes of this sort could be propagated from cuttings and immediately supply some new and valuable variety."

Thus we have the slow processes of Burbank outdone—speeded up a thousand-fold. It requires but little imagination to vision a new plant kingdom when the plant specialists discover the secrets and the rules having to do with the dosages of radium and X-rays.

Dr. Stadler of the field crops department of the University of Mis-

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Oklahoma's Sweet Potato Kings—

Get More No. 1's

By Charles Kilpatrick

Ft. Smith, Arkansas

"THIS has been a hard year for sweet potatoes, and if we had not fertilized, we would have made a complete failure." Thus spoke Sterling Camp, who with his brother, Tom Camp, comprise the farming team of Camp Brothers, Castle, Oklahoma. For several years they have been the "sweet potato kings" of Oklahoma, producing between 20,000 and 30,000 bushels every year. However, sweet potatoes are not their only interest, as they are following a well-balanced system of farming. Tom Camp has won the Master Farmer's Medal.

"While getting better than the average yields from our sweet potatoes," Sterling Camp continued, "the percentage of No. 2's was far too high. We resorted to commercial fertilizers, using the 4-12-0 mixture. Our yields increased some, but still the percentage of No. 2's remained high, which meant that we were not getting enough marketable potatoes. This past spring Mr. H. L. Bankhead, our county agent, was consulted, and he assisted us in laying out a series of tests with commercial fertilizer.

"The tests we made were as follows:

"As the fertlizer previously used contained no potash, these tests were planned primarily to study the effect of potash in improving the quality of potatoes and increasing the yield of marketable potatoes.

"All of the fertlized plots received the same amounts of nitrogen and phosphoric acid, while the amount of potash varied from no potash to 24 per cent.

"The fertilizer without potash gave an increase over no fertilizer of only 48 bushels per acre of marketable potatoes. The fertilizer containing 4 per cent potash gave an increase over no fertilizer of 63 bushels, while the increase of marketable potatoes from the fertilizer containing 24 per cent potash was 77.5 bushels.

"The results show that the yield of marketable potatoes increased as the percentage of potash in the fertilizer increased.

"And thanks to our county agent and extension service for laying out these demonstrations for us," concluded Mr. Camp. "We believe they have shown us our mistake."

Fertilizer used	*Yield per acre No. 1's (Marketable)*	*Yield per acre No. 2's (Seed)*
No fertilizer	129.5 Bu.	145 Bu.
500 lbs. 4-12-0 (N.P.K.) Per A.	177.5 "	132.5 "
500 lbs. 4-12-4 " " " "	192.5 "	125 "
500 lbs. 4-12-24 " " " "	207 "	112 "

A Master Farmer

John Reynolds of Middletown receives the honors for 1929

LAST winter 12 men from five states had the honorary degree of Master Farmer conferred upon them and each received a medal awarded by the *Pennsylvania Farmer* at a banquet held in Harrisburg, Pa., in the presence of 300 guests. These 12 men were picked from 400 nominees by a committee of 12 judges, all of whom were men of agricultural importance in the eastern United States.

The Master Farmer project is a movement to honor outstanding achievements in agriculture. It is nation-wide in its scope and is conducted under the auspices of a cooperating group of farm papers.

The Delaware Master Farmer for 1929 is John D. Reynolds, of Middletown. Mr. Reynolds is a share renter. He says, "I would rather rent a good farm than own a poor one." He is not one of those share renters who moves every year for one reason or another. Mr. Reynolds and his landlord cooperate in the farm enterprises and as a result this 365-acre New Castle county farm has been brought into a high state of production during the last 12 years.

The farm is completely fenced and all fields are conveniently located in reference to the farm buildings. The farmstead, with its well-kept lawn, is located some distance from the road at the end of an avenue of fine shade trees.

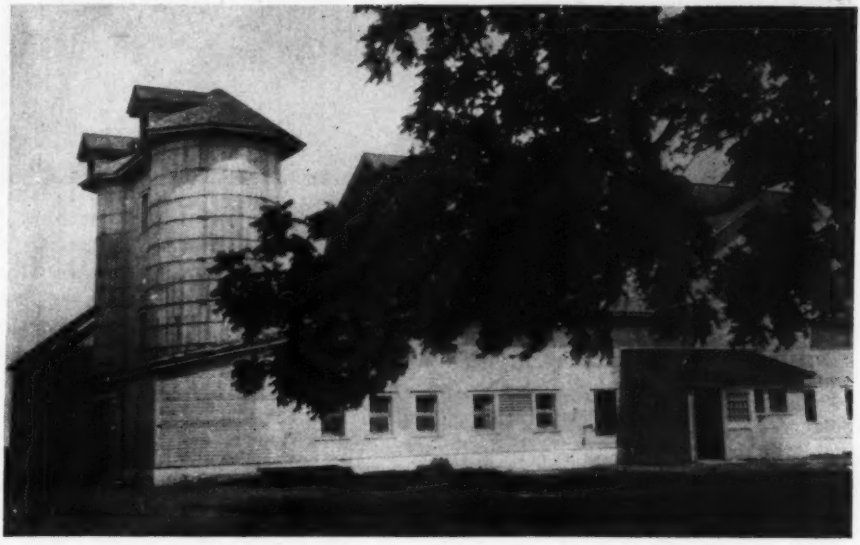
The rotation practiced by Mr. Reynolds consists of *(1)* cultivated crops; *(2)* wheat, 2 years; *(3)* sweet

Harvesting wheat with a binder to save the straw for bedding.

from DELAWARE

By George L. Schuster

Delaware Agricultural Experiment Station



A cooperating landlord supplies Mr. Reynolds with this fine equipment.

clover. This season there are 125 acres of wheat, 43 acres of corn, 23 acres of sweet corn, 20 acres of tomatoes, 65 acres of sweet clover, and 30 acres of permanent alfalfa. The remaining acreage is occupied by woodland, homestead, and garden crops.

The farm has been limed every four years and as a result there is sufficient lime in the soil to grow the crops desired. Mr. Reynolds says, "I grow my own nitrogen." A visit to his sweet clover and alfalfa fields proves his statement. Besides this he annually produces over 500 tons of manure from his livestock. He buys superphosphate and muriate of potash in 200 pound bags and mixes this at home in the proportion of three bags of superphosphate to one bag of muriate of potash making approximately an 0-12-12.

0-12-12 Better

At one time Mr. Reynolds used an 0-12-6 mixture but now he believes he obtains better results from the 0-12-12 which is used for all crops. Additions of nitrogen are made by manural applications where needed. For wheat he uses 300 pounds of 0-12-12 per acre, 200 pounds is applied to corn in the hill, 1,000 pounds is used for tomatoes, half broadcast and half in the hill. His average yields from these practices have been 30 to 40 bushels of wheat per acre, 8 to 10 tons of

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Don Clark and his alfalfa.

Banking on Alfalfa

By J. L. Mac Dermid

County Agent

UP in northern Vermont, in a county which borders on the Canadian line and drains almost entirely towards the St. Lawrence river, an interesting alfalfa contest is being conducted.

A thrifty little Vermont bank, located in a village of little over 1,000 population, has offered prizes totaling $300, for a three-year alfalfa contest. A feature of this contest is that each division is based on the 1931 seeding, and that soil preparation receives as much consideration (and prize money) as the results of each of the first two years' crops. It all started as the result of a short talk given by Don Clark of Glover, Vermont, at the 1930 Barton Farmers' Day. Mr. Clark is a young farmer whose name is already well known in his county.

He distinguished himself in the 1929 Farm Bureau Membership Campaign, is Master of Glover Grange, and the youngest director in the Orleans County Farm Bureau.

On the occasion in queston, Mr. Clark was one of 300 farmer guests of the Village of Barton. A forenoon "talkie" and a fine dinner had been enjoyed and the program of informal talks was begun. He was asked to say a few words on "What Barton Can Do for Its Farmers." His suggestions were numerous, and to the point. Among them was the sugges-

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By E. R. Jackman

Oregon State Agricultural College

Prophesying PRICES

IN recent years some of the potato dealers of a speculative turn of mind have done their gambling only after painstaking studies of the weather. In former years the dealers had all the best of it as price reports were not available and no uniform grades existed upon which to base printed price records. But this has all been changed with the widespread adoption of the U. S. grades, telegraphic price reports by the Bureau of Agricultural Economics, telephones in every farm house, and automobiles and radios.

Today the potato buyer faring forth hopefully on a hot market tip that the price is advancing, is quite apt to be met by growers with better and later market information obtained from their radio loud speakers. So the potato game "ain't what she used to be", and veterans of the trade are forced to sit around and get what satisfaction they can from swapping yarns of big deals they made back in 1905 when they knew of price advances or drops several days ahead of the farmers.

News disseminating channels are today just as available to farmers as they are to dealers. When one considers also the price and yield forecasts put out regularly by the Department of Agriculture it is not hard to believe the wail of hundreds of potato dealers that their business has been reduced to a brokerage basis with no possibility of speculative profits.

And now the last stronghold of the speculative type of dealer seems about to lose all of its strategic importance. During the past few years a few clever dealers here and there have discovered more or less independently that by watching the weather in the important potato producing areas they can beat the government forecasts by about a month

The potato crop is perhaps more susceptible to weather changes than any other crop. That is why large acreages do not necessarily mean large yields or vice versa. When that great potato producing area, for example, from Minnesota around to Michigan has a dry hot July, observers know that millions of bushels have been lopped off from production.

If August continues hot and dry, the shrewd observer gathers his shekels in one hand and his contract book in the other and hies himself out into the byways to "take on a few spuds" as he nonchalantly expresses it. The growers from whom he buys will read in the government crop reports about a month later that

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Bill Heintz's 4-8-8

By R. E. Marshall

Columbia, Missouri

BILL HEINTZ is a thrifty farmer and a natural born leader of St. Louis County, Missouri. The soil on his farm and in his neighborhood is hilly and until the spring of 1929, neither he nor any of his neighbors had used any commercial fertilizer notwithstanding the fact that all of them were growing some early potatoes for the St. Louis market.

Last spring, Assistant County Agent Lyle Seaton and the writer went to see Bill about putting a fertilizer demonstration on his early potatoes. We outlined the usual procedure, anticipated the benefits to be secured, and ended by telling him that we would furnish the fertilizer combinations for the demonstration.

After Bill had agreed to furnish the geography and labor for the demonstration and as we were about to leave, he turned to me and said, "Are you sure there are no hooks in this? I always have been skittish of these offers to get something for nothing."

Seaton assured Bill that there was no hook in the proposition, all we wanted him to do was to "tell" all his neighbors about the extra growth and yield of the potatoes.

As summer wore on, we kept close track of Bill's potato operations to make sure that better practices of spraying and cultivation were carried out, and when it came time to dig the plots, Bill gathered in a number of his neighbors to prove that there were added bushels beneath the bigger vines.

Without any fertilizer the potatoes made 174 bushels per acre; with 700 pounds of 4-8-0 there were 179 bushels per acre; but when 8 units of potash was added, the 700 pounds of 4-8-8 brought the yield up to 238 bushels.

A few days after the demonstration meeting, just when Bill had the potatoes dug on his fertilized plots, a buyer came along and offered him $1.75 a bushel for all the potatoes he had out. The next day, Bill dug the potatoes on the unfertilized acreage and stored them in his cellar.

In two weeks the buyer came back, asking for more of those "good potatoes." Bill took him into the cellar and showed him the potatoes. The buyer took up a handful of the tubers, squeezed them, then looked awry.

"No," he said, turning to Bill. "These are not the same potatoes. These are not nice and firm like the others were; $1.50 a bushel is the best I can do on these."

So Bill sold the potatoes from the unfertilized plot for $1.50 per bushel. However, he put the increased bushels that the fertilizer had shown him, together with the increased price the buyer had paid for the fertilized potatoes, and made a story in which a 4-8-8 analysis was the oft-recurring theme, further details of the story being added by way of proof of the correctness of the theme. And he kept his part of the agreement. He told the story far and near.

The results the spring of 1930 as seen through the eyes of Wm. Bayer, manager of the Chesterfield Farmers' Elevator Co., some six miles away, is that eight tons of 4-8-8 fertilizer were sold in Bill's neighborhood, mostly in two to four bag lots!

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¶ These American roosters appear aggressive but are no match for the fighting cocks of India where they are sent to act as—

Feathered Missionaries

By

J. J. De Valois

Katpadi, South India

PROBABLY no new missionaries from America were ever more talked about before their arrival in the Arcot Mission of South India than some late recruits—a dozen Rhode Island Red and White Leghorn "feathered missionaries."

The Indian pastors, teacher-catechists and village Christians were told that four men, each with two wives, were coming out from America to do missionary work in India with us.

"Kurdathu; Kurdathu. Sare alle. Verndaam!" (Don't allow it; its not right; we do not want them) was the unanimous exclamation from the worried Indians. "For 75 years the missionaries have been teaching us that polygamy is sin and that it should not be tolerated in the Christian church. How then can we receive these new missionaries if each has two wives.

"Yes, but conditions in America are changing. The old time missionaries came out with long beards or full mustaches. The women then wore long skirts and high-necked blouses. You accept our present young men without even a mustache and our American women with their bobbed hair and short skirts. We must not be old fogies. We must be progressive and keep up with the times," taunted the American speaker.

"Yes, that may be true. Perhaps we are too conservative, but we cannot accept these new missionaries if they each have two wives. Please cable the Board of Foreign Missions in New York not to send them," was the decided opinion of the Indian people.

When finally the fact was disclosed

that these new workers were of the feathered variety, the anxiety of these men gave way to hearty laughter. That changed the situation. They agreed that such missionaries were very necessary and most welcome. Then the questions began to roll in. How much would be the cost of shipping a dozen fowls 12,000 miles? Who would feed them on the way? How could I trust strangers to do that for me? Would they arrive alive? How was it possible for one highly bred hen to lay over 300 eggs within a year! Surely I must be mistaken that roosterless hens would lay infertile eggs that even the most orthodox vegetarian Hindu could not take objection to. How was it possible that baby chicks could be shipped a thousand or more miles before they needed their first feed? Could eggs really be hatched in a wooden box with only a lamp? Fifty thousand eggs in one such incubator; America surely is a land of wonders!

These particular ladies and gentlemen left the Iowa State College Poultry yards in October headed for the New York headquarters of the Board of Foreign Missions. Immediately they were caught in a railroad strike and were returned to Ames. It looked as though they were to miss their boat but arrive they did the last day.

Transportation Difficulties

In the meantime the bags of feed were lost and the birds descended upon the Foreign Mission Secretary in the heart of New York City without any feed and a six week boat journey ahead. The city-bred secretary was in a dilemma. Advice was sought from all quarters, the New Jersey Experiment Station, a poultry farm, even neighbors trained in the raising of chickens, with the result that the morning of their departure fifty pounds of scratch grain and fifty pounds of mash was bought in the downtown section of the city. The birds were soon on their way to the

The missionary, with a sun-helmet, explaining the good qualities of one of the "feathered missionaries" to a group of interested school boys. Notice the solid granite fence posts which cost five cents delivered.

A swarm of flying, white ants. Early in the rainy season these termites leave their ant hills at night and are attracted by a light. They then drop their wings and soon die and often can be gathered by the gallon in the morning. They are considered a delicacy. These ants are a great pest but they do make excellent feed for poultry in supplying fresh animal protein.

docks accompanied by their feed. One of the crew of the "City of Shanghai" was given instructions as to the care of the precious shipment.

A novel form of insurance was next secured for the party as the shipping company disclaimed any responsibility for the safety of the birds. Provision in case of the demise of any of the fowls was made in the following ambiguous terms:

"It is understood and agreed, in addition to the perils hereby insured under this policy, to include the risk of mortality and all dangers incidental to the transportation of the cattle but not to be liable for damage or loss of any animal landed alive. Each animal separately insured."

"Warranted by the assured that the animals are sound and healthy when received on board and that in case of the death of any animal such disposition shall be made as to realize the fullest salvage for the benefit of this company."

The full cost of transportation for the globe trotters was $115.30:

Expressage Ames, Iowa to New York	$18.05
Trucking in New York	2.00
Feed for the journey	5.12
Ocean freight and care	69.00
Insurance	11.03
Madras harbor dues and clearance	7.10
Freight in India to destination	3.00

The birds arrived in perfect condition with a few eggs in the coop to prove that they meant business in India. The 12,000 mile trip extending over 45 days evidently had not daunted the courage of these pioneers. The people flocked around to greet the "feathered missionaries" they had heard so much about. Several expressed disappointment that the fowls were not larger. "We expected them to be three feet tall," said one man. Value evidently meant size in their estimation. They could not appreciate the inherent quality that had been bred into these "300 eggers."

Poultry Improvement

The wheels of progress have moved so fast in America that it is hard to believe that only 50 years ago the early pioneers invaded the trackless prairies of the Middle West. Each household took with them the family cow for milk and a few mongrel hens for eggs. The large standard bred flocks of Wyandottes, Leghorns, Plymouth Rocks and Rhode Island Reds raised on a commercial basis in that very area today, present quite a different picture. It really is only within the last ten years that the most rapid development has been made in the Middle West where the majority of

the American billion dollar industry is still located. Individuals always resident in the community or the country cannot appreciate the great changes that are taking place so rapidly in America. Persons who have been residents abroad for seven or eight years and who return are best able to compare properly and appreciate most fully what is going on. Such has been the position of the writer.

The motor car or express train is no greater improvement over the covered wagon or ox-cart as a means of locomotion than is the present day organized American poultry industry compared with the few scrub hens kept by the early pioneer. Extension experts still bewail the lack of interest shown in selling eggs and poultry on a quality basis. If such persons could step into India for a few months study, they would be more optimistically inclined toward those conservative farmers of America. The Indian poultry industry is still in the homesteading period.

So far India has no standardized poultry. "Commercial poultry farming" is still an unheard of term. The English Government officials, business men from the West and Missionaries have been doing something in the way of importing improved fowls and through their influence a few small poultry yards have sprung up. A few of the Provincial Governments have added poultry husbandry departments to their agricultural improvement programs, but most of them are still too busily engaged in the larger projects of cattle and other livestock breeding work to consider poultry work which many still consider of minor importance.

The United Provinces have done more than any other section. They have a very well equipped poultry plant and have done a great deal to popularize the industry in their section. Last year they made a beginning at marketing eggs in England. A poultry plant with a hundred laying hens is still a large enough attraction to bring visitors a good distance.

The average mongrel hen is just like Topsy—she has just grown. They are a nondescript lot of many and varied colors. They have the habits of wild birds laying clutches of 10-15 eggs and then going broody. Ordinarily about three clutches are laid a year, of which two are usually hatched. The eggs on the average do not exceed an ounce and a half each. Many are mere sparrow eggs of an ounce and a quarter.

Families frequently keep a few scrub hens around the place as scavengers, getting the few eggs they can and raising a few chicks to spread a feast for a visiting relative or friend. When we speak of incubators of 50,000 eggs capacity, the farmers of India stand aghast. Even a 50-egg machine will attract large crowds at an exhibition. The idea of shipping baby chicks is entirely unknown.

The Fighting Cock

Traveling to the villages of India, one is certain to see the proverbial fighting cock. How carefully they are groomed and fed! The owners of these birds take them to the weekly shandy—village market where a dozen or more villagers gather—and one of the favorite sports of the day is the cock fight. If the fight is one to test the endurance of the birds, they may continue for hours and hours. The endurance of the fighting cock is marvelous indeed. Very frequently the contest is designed to be a fight to a finish. In addition to the well developed spurs of the gentlemen, small knives are also tied to the legs of the birds to facilitate them in their destructive work. The birds are carefully fed and trained for these contests and are even given a good drink of toddy—intoxicating drink—to instill more courage and fight into them. The villagers of India cannot afford to maintain the English racing sport or the American baseball game. Nor have they $20.00 to buy ringside seats

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DIET vs. DRUGS

By C. T. Gregory

Purdue University

WHY pamper the weak corn plant? It can never be anything but weak and its children, the corn kernels, will almost unfailingly continue its weakness. Plant this weak seed, give it good growing conditions, and it will survive. But, let the weather be adverse, let the soil be low in fertility, and almost invariably it will succumb.

Treat this seed with one of the organic mercury compounds and it will almost as invariably live. By the treatment we seem to throw about the little seedling a zone of disinfected soil in which the death-dealing fungi or bacteria cannot survive. The pampered seedling, once established, usually grows and may produce an ear, but in any event it will produce pollen. Therein lies the greatest danger of subsequent trouble.

Pick the seed corn in the field from plants that have produced well matured, well filled ears. Such plants show that they have found the diet to their liking.

Pollen of any plant carries within it the characters of weakness or of strength lying within the plant. The pollen of the pampered weak plant carries the inherent weakness of the plant that made seed treatment necessary. It spreads this fatal fault to many of the surrounding plants, and then the farmer wonders why his corn does not improve. He fears it is running out and hunts a new strain. This is one danger of treating poor seed corn that is not immediately apparent and which may be lost sight of in our enthusiasm over the increased yield.

Mother Nature places many troubles in the path of the little plant in the form of low temperatures, excess moisture, parastic fungi and bacteria. Her's is the idea of the survival of the fittest. Why balk Mother Nature in her endeavor to rid herself of the weaklings? Why balk her with a man-made disinfectant that kills the fungous and bacterial enemies of the seedling corn plants? Far better to aid Mother Nature and pick seed from the

strong plants in the field or test the seed corn and use none but the strong germinating seed.

It might seem from what I have said that I am utterly opposed to seed corn treatment but I do not oppose it. On the contrary I have encouraged Indiana farmers to use it, but, always after they have eliminated weak strains by testing or field selection. There is no question that during cold wet springs even the strong seedlings may suffer from over-exposure. Under such conditions it usually pays to treat, but good corn growers have frequently used the treatment and found it did little or no good. However, three or four cents an acre is a small premium to pay to insure the seedling against all chances of rotting.

A Disease of Weak Plants

All evidence shows that corn root rot is a disease of weak plants. Perhaps it is a misnomer to call these troubles root rot because it is not always only the roots that are rotted. Usually the stalk is rotted and frequently the shank of the ear. But, call it what you will, there exists a disease of corn that reduces the yield and greatly impairs the quality. Furthermore, all experimental evidence and the evidence of corn growers prove that it is a disease of weak plants. These same evidences also prove that the proper diet of the corn plant plays a leading role in the control of this root-stalk-shank-ear rot disease. Even the weak and ordinarily diseased strains can be made relatively healthy, better yielding, and better in quality if the proper diet is furnished.

The corn plant is becoming quite human in its need of a dietician to prescribe for its ailments. This situation demands the attention and should command the attention of extension agronomists and plant pathologists.

Corn diet means available fertility, and more than this, it means the proper balance of the different essential elements, nitrogen, phosphorus, and potassium. To help their patients, these corn dieticians must learn to read the symptoms in the corn plants. Moreover, they must learn to interpret their reading.

We know that nitrate deficiency is indicated by a yellowing, firing, and finally the death of the leaves. The characteristic of this firing is that it extends up the midrib and spreads outward over the leaf. The plants will often be stunted under conditions of serious nitrate deficiency or starvation. Furthermore, this trouble is liable to develop at almost any time in the growing season and is often called drought injury.

Potash deficiency is characterized by the firing of the margins of the leaf. In severe cases there is often a yellow striping of the leaves accompanied by stunting and severe burning that may be mistaken for nitrate starvation. The internal nodal tissues are also brown or rotted.

Phosphate deficiency appears as a stunting of the plants without leaf firing. Frequently, however, the margins of the leaf will turn purple. The internal nodal tissues are also brown or rotted.

Let's suppose for example that we examine a field and find decided symptoms of nitrate starvation. But suppose, too, in this same field that potash deficiency is just around the corner, so to speak, and is masked in its expression in the corn plant by the predominant nitrate deficiency. This is where the Hoffer stalk test will play its part.

Probably every specialist has heard of this test, and I will not describe it in detail. Let me merely say that the nitrate test, sulphuric acid and diphenylamine, will give a blue reaction in the presence of excess nitrates stored in internodal stalk tissues. The potash test, hydrochloric acid and potassium thiocyanate, will indicate the iron deposits in the internodal tissues when potash is deficient.

With this test at hand let us go

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Weed Killers

By L. R. Combs

Iowa State College

MUCH interest is developing in Iowa and other Midwestern States in the use of chemical weed killers. This interest is due largely to two or three factors. The first of these is the development of chemical weed killers at experiment stations throughout the country and the second is the realization on the part of farmers of the seriousness of Canada thistle, quack grass, European bindweed, and other weeds.

In Iowa the interest has been increased by new weed laws which place the responsibility for weed eradication on county and township weed commissioners who have authority to go on premises, after the owner or tenant has been warned, and clean up noxious weeds.

Inspecting the results of an application of sodium chlorate to quack grass.

Demonstrations in various counties of Iowa during the 1929 growing season showed the practicability of using chemical sprays to kill weeds. The only type of chemicals yet found which will effectively kill underground parts of weeds as well as the tops are the chlorates, according to R. H. Porter, extension plant pathologist at Iowa State College, Ames, Iowa. These chemicals are absorbed by the tops and carried to the roots.

Sodium chlorate is the one which has been tried the most extensively at Iowa State College. One pound per gallon of water is considered the best solution and the liquid is applied at the rate of 2½ to 5 quarts per square rod. Quack grass or Canada thistle may be sprayed any time after the plants are six to eight inches high until they begin to blossom. With a dense stand the most thorough job can be done when the plants are about six inches high.

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¶ E. V. McCOLLUM (right) is the subject of this article which is fourth in a series

By

Dr. A. S. Alexander

University of Wisconsin

The Inquiring Mind *and the* Seeing Eye

DR. E. V. McCOLLUM came to the Wisconsin Agricultural Experiment Station from Yale University in 1907. After I had studied the man day by day, talked with him many times, asked him difficult questions, gone to him for counsel, and watched the progress of his work for several years with keenest interest, I made this prediction:

"Mac and the *rat* are destined to revolutionize the world's knowledge of animal nutrition."

That prediction was more than verified. The marvelous discoveries of this plodding, persevering, self-sacrificing, conscientious, and eminently well-trained young chemist culminated not only in throwing the light of truth upon many previously puzzling problems of animal nutrition, but disclosed facts of paramount importance relative to the dieting of the human race.

> Give unto me, made lowly wise,
> The spirit of self-sacrifice;
> The confidence of reason give;
> And in the light of truth,
> Thy Bondsman let me live.
>
> *Wordsworth.*

Often, I met Dr. McCollum in the corridors of the Agricultural College or visited him in his laboratory. There he was surrounded by tier upon tier of cages, housing rats of all colors and sizes, and the atmosphere of the place sometimes suggested what Shakespeare called, "the rankest compound of villanous smell that ever of-

fended nostril." As I noted the Doctor's tall, spare frame and sometimes tired and drawn face, from which beamed those great soulful, kindly eyes, I said to myself:

"If charity should begin at home, I think Mac had better completely feed himself; for evidently his brains are burning up his body."

I wondered, too, if ever there was another man so completely captivated by the lure of his entrancing, thoroughly organized and persistently pursued research work. Always, however, he was willing to cease his labors for a time and discuss with me some puzzling questions regarding azoturia and lymphangitis of the horse, rickets of the hog, and pregnancy disease of the ewe.

Dr. McCollum proved a veritable "walking dictionary" of information, wonderfully exact in the facts he had stored away in his marvelous memory yet, withal, simple, unassuming, and modest in his method of advancing his opinions and conclusions.

Is it any wonder that such a patient, persistent, and thorough scientist, perfectly prepared and equipped for his work, succeeded so well in his search for truth that he has been given recognition the world over and honored by many scientific societies?

Born on a Farm

Elmer Verner McCollum was born March 3, 1879, on a farm near Fort Scott, Kansas, and early became inured to hard work. At the age of seven he began milking cows and when 11 worked in the fields. A year later, when his father's health failed, he and his brother took entire charge of the farm work. Their herd numbered some 25 head, and the butter from the milk of these cows was the family's chief source of income.

At the age of 17, when he had attained the height of 6 feet and weighed 122 pounds, he was allowed, by special dispensation of the Prin-

Laboratory, showing Dr. McCollum and cages containing his sanitary rats.

cipal, to enter the high school at Lawrence. He worked his way through the four-year course, making a good record. Then he entered the University, took two years of pre-medical work, and then devoted his time and talents to organic chemistry, with which study he had become enthused.

After an additional year of post-graduate work, he entered Yale University, in the autumn of 1904 and received the degree of Doctor of Philosophy in 1906. While at Yale he earned his expenses by tutoring, and left the institution with $1,500 on hand.

From 1907 to 1917 he was a member of the faculty of the Wisconsin College of Agriculture, where his eminent work was done in collaboration with the noted chemist Professor E. B. Hart. Then he was appointed Professor of Biochemistry in the School of Hygiene and Public Health of Johns Hopkins University, Baltimore, Maryland. There, surrounded by multitudes of his beloved "sanitary rats," he is today working away as diligently and delightedly as ever, delving into the hidden mysteries of nutritional chemistry.

Dr. McCollum's reputation as a research worker has chiefly been earned by his discoveries relative to the varying values of fats in the nutrition of animals and man.

Dr. M. D. Munn, President of the National Dairy Council, stated in the *Dairy Farmer* that it took nearly five years of experimental work on innumerable combinations of diets before Dr. McCollum finally demonstrated that growth proceeded in young animals when butterfat was added to their ration, and that the same food mixture would not induce growth when lard, vegetable oils, and certain other fats and oils were used in place of butterfat.

This was the first definite scientific determination that butterfat contains some element of principal essential to growth, not found abundantly in any other food fat. He, therefore, concluded that there is some substance in butterfat which is not found in fats generally, and which is absolutely necessary for the promotion of growth and the proper maintenance of life in the young and adult animal. He also determined that the fat of egg yolk and that of the vital organs of animals produced a similar effect on growth.

"Vitamin A"

This growth-promoting element was given the title of "Fat-soluble Vitamin," or "Vitamin A." Its discovery was followed by many experiments demonstrating the supreme importance of milk in the diet of the human race. That fluid nutrient is now recognized and correctly valued as the chief and most readily available source of Vitamin A, through its butterfat, and is known further to contain other vitamins, a high quality protein and the mineral elements, calcium and phosphorus, which build up bones and form sound teeth in the young.

Dr. McCollum at the Wisconsin Station and shortly afterward Osborne and Mendel at the Connecticut Station, showed that rats failed to grow after being fed for three or four months on rations of purified nutrients which lacked fats. The addition of lard, commercial olive oil, or commercial cottonseed oil caused no improvement, but when butterfat, egg fat, or kidney fat was added, the diet was made complete and normal growth and reproduction resulted. What was lacking in the ration was not fat, but some substance soluble in fats and hence carried in the butterfat and egg fat. It is this mysterious element that is now known as Fat-soluble A, or Vitamin A, and for discovery of which Dr. McCollum is given chief credit.

Further investigations by Dr. McCollum and others have shown "that the cereals are generally poor in Vitamin A, with the exception that yellow corn contains enough of it for

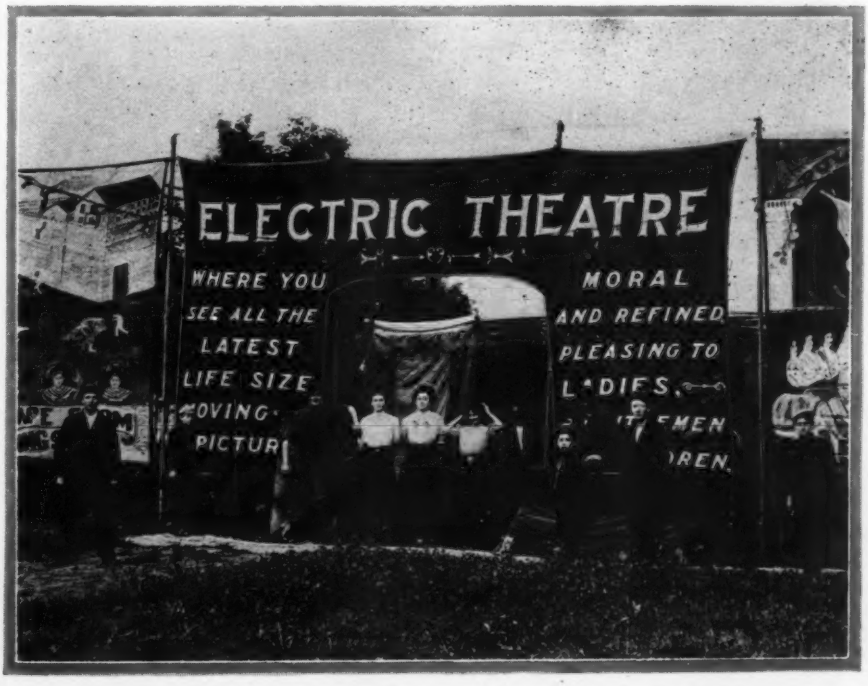
(*Turn to page* 60)

Ready for an argument.

PICTORIAL

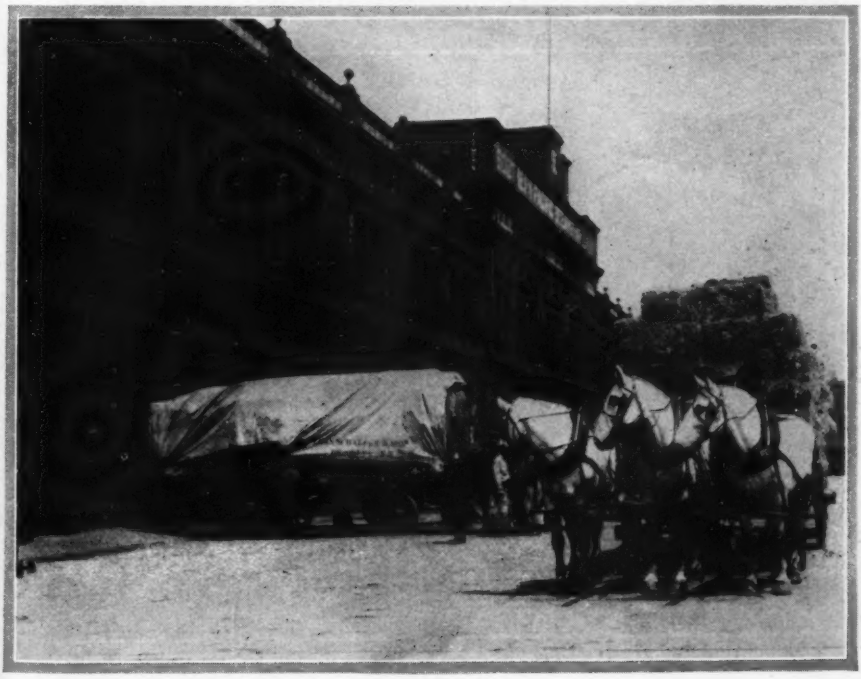
Above: Two mule deer in Sequoia National Park, California. Deer, bears, and many other wild animals in the California parks are becoming almost as blase to strangers and automobiles as a chow pup in a dogstore window. Below: Vacationing.

Above: Louisiana's first sugar bowl, the inscription of which reads "This is the kettle used by Etienne de Bore, the father of the sugar industry in Louisiana when he first succeeded in granulating sugar in 1795." Below: An old-time movie.

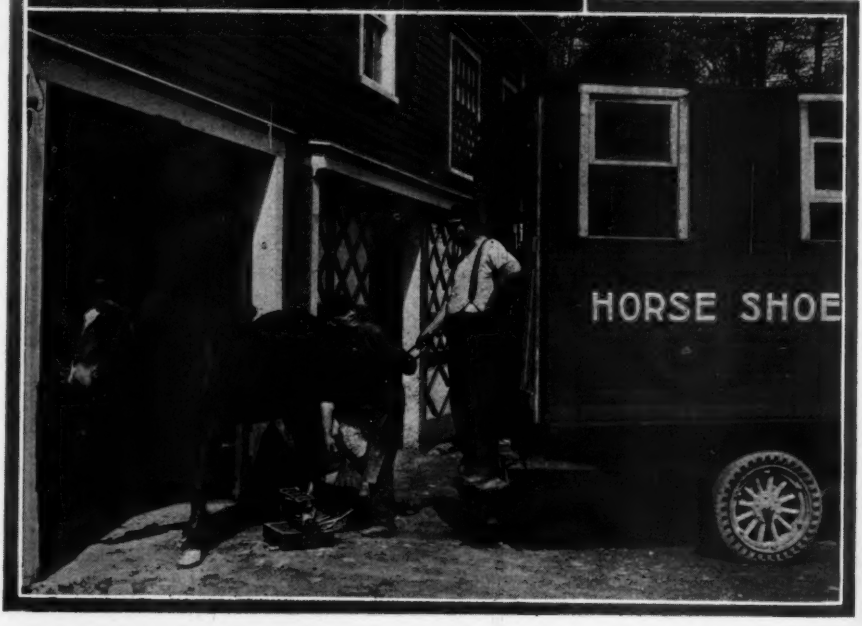


The main street of Lake Charles, La., as it was in 1887, above, and as it is today, below.

Above: Giving prunes the sunshine treatment in California. Below: Hay wagons in the big city—hauling hay in Greater New York.



This picture not only has rustic beauty, it shows a hastily constructed, but effective, irrigation ditch on the farm of T. J. Charles, Republic county, Kansas. The Charles farm of 480 acres is half bottom land and half second bottom lying between the Republican river and White Rock creek. Its owner had for a long time felt convinced that irrigation from either stream was possible. Last year with one of the worst drouths of the century in northern Kansas, Mr. Charles decided to put the theory to a test. With a four-inch centrifugal pump and a tractor for power, a crew of two men managed to irrigate about 50 acres of corn before drouth had ruined it. He estimated that for each hour the pump was run, an acre of corn was irrigated and 30 to 50 bushels of corn assured.



Below: In the old days you took your horse to the smithy. The modern blacksmith comes to your horse, hauling his entire shop on a truck.

The Editors Talk

The Effects of Declining Prices

There is considerable speculation as to how national prosperity will be affected by the downward trend of basic commodity prices should this decline continue.

That this is no mere academic question is well illustrated by a strike of most of the workers of one city last month. Due presumably to price reductions of a basic commodity produced in that city, a wage cut of $1 per day was proposed. Thus, lower prices often mean lower wages which may result in strikes. In this case the entire city was much happier when the difficulty was settled and everybody was back at work.

As one newspaper stated: "It is a dull summer at best but yesterday's experiences demonstrated that even a dull period is something far, far different from a complete suspension of business operations."

Will a continued decline in basic commodity prices be proportionately bad for the farmer? The answer is perhaps not. Although the prices of many agricultural products have declined with the general downward trend, a continuance of the trend may bring about a more drastic price cut for industrial products than for agricultural products. This would mean that 100 pounds of cotton, tobacco, corn, or other farm produce would acquire an increased purchasing power in industrial products.

If the general decline should continue, there is hope that it would produce a better balance between agriculture and industry, placing a higher relative value on farm produce. In recent years industry has been well off, while the farmer has suffered from relatively lower prices. Economists say that such a situation cannot continue indefinitely. Perhaps the change is just over the horizon.

The Need for Realists

Addressing the recent convention of the Canadian Society of Technical Agriculturists, Dr. G. F. Warren called attention to the fact that agriculture is now passing through a period of change, the significance of which is far greater than that of the industrial revolution.

Although we are still too close to these changes to judge their real import, it is vitally necessary to ferret out all obtainable facts. It is up to us to study industrial and social causes and effects regardless of whether our findings will be pleasing or displeasing to our businesses and ourselves.

The optimist does not deem this the correct method. He is not always keen about facing facts, but prefers to will things by his optimistic attitude of persistent talk, apparently hoping to eventually bring about the desired condition of affairs.

The optimistic attitude undoubtedly has some good points; however, busi-

ness should not be run on an emotional basis. Amalgamations of banks and even governments cannot permanently control or alter the effects of fundamental economic changes. How then can mere talk effectively control such conditions?

These days of change need realists, who sound all available sources to find facts and face these facts courageously, making adjustments accordingly. This does not mean that we must sit still and accept a calamity. However if a storm is coming it is best to know this with ample time to reach the cyclone cellar. In the last analysis it simply means that we must see things as they are and be honest with ourselves.

How's Your Calcium?

Our pages are full of problems concerning the best diets for plants. As a matter of variation, now comes an item of interest in human diet.

Lack of calcium, according to Dr. Walter Timme of the Neurological Institute, New York City, in many cases is responsible for crossness, tiredness, misbehavior, and other symptoms of problem cases, both child and adult. But whether this lack of calcium in the blood can be overcome by increasing the quantities of milk, fresh fruits, vegetables, and cereals eaten, Dr. Timme has not said.

The supply of calcium to the blood is controlled by the tiny parathyroid glands in the neck, scientists now believe. When these glands reduce the supply of calcium there is apparently a disturbing effect on the nerves and subsequent conduct of the individual who then misbehaves, showing inordinate fatigability, irritability of temper, and even incorrigibility.

"How's your calcium" may be the "retort courteous" to the man in temper. Offer him a glass of milk and see what happens.

Taxation

The total of funds raised by taxation is increasing every year, making of taxation a more and more serious problem. We are seeing a great deal on the subject in the press and we hear it talked at every turn. Rightly so, for taxation is something which affects all of us and particularly our American farmers.

In the early history of the country when the largest part of our population lived on farms, the land a man owned was a relatively good measure of his wealth. Under such a system a general property tax was a fairly just tax. The situation has changed and at the present time the land a person owns is no fair index to his wealth. In fact with the great congregation of people in cities, the general property tax has become worse than useless. It has proved an actual hardship on our rural communities.

The underlying principle in taxation is to make the man who has the most pay the most. The income tax was a step in this direction. However in many parts of the United States, the property tax is still a very important part of the revenue collected. In some sections where this exists some classes are very heavily, while others are very lightly, taxed.

When our population was not so mobile, in general as young people finished the schools in the community, they settled in the same community. However,

the rapid movement to the city means that the country school system is educating a large part of our urban population. This works an injustice on rural people.

Another example for instance is the local flour mill and other local industries that were taxed for the support of the community. Nowadays a good deal of the trend of industrial growth has been toward concentration of industries in large centers, as large milling and baking industries which have replaced the local plants in their service to the rural communities.

It used to be fair to have roads supported by local taxation. Recent studies indicate that of the vehicles on State roads only a very small proportion are owned within the township, a somewhat larger proportion are owned in the county, but the largest part of the travel is done by vehicles outside of the county. This means that for road support the local community is not a large enough unit and should not be taxed so highly for road upkeep.

There are many proposed solutions for the taxation problem from as many eager students of the problem. Income taxes, inheritance taxes, the proper allocation of State and Federal taxes, and many other propositions have been considered for the adjustment of what is generally conceded the abuse of the general property tax. Certainly something must be done and the subject deserves active thought on the part of every voter sending representatives into law-making positions.

Fertilizers in the Pacific Northwest

The cotton, potato, tobacco, and other intensive agricultural areas of the East are often spoken of as the fertilizer territory of the Nation. Hence, the catch phrase: "As goes the cotton price, so goes the fertilizer tonnage." These areas are of undoubted importance and without them the fertilizer industry would not be what it is today. However, if the industry is to attain a profitable degree of stabilization, it must face the big job of extending the use of fertilizers over a larger territory, into states which now may be small consumers.

This fact attaches added importance to the growing interest in the use of fertilizers in the Pacific Northwest, due to the adoption of more intensive agricultural programs in that section. The States of Washington, Oregon, Idaho, and Montana comprise a huge empire served by a varied, but in spots intensive, agriculture.

What is more intensive than the production of apples in the Wenatchee Valley of Washington? Land in bearing orchards is worth $1500 and more per acre. The acre investment in equipment and irrigation systems is large and permanent. In the production of quality fruit for distant markets, growers cannot afford to risk poor crops. Laid out in these orchards are many experimental plots to study the effect of complete fertilization. These plots will do much to properly direct the increasing use of fertilizers.

In the vast wheat fields of eastern Washington where nitrogen is a limiting factor, the profitableness of commercial nitrogen is being studied. Fertilizer interest is increasing in the coastal berry and trucking districts, as well as in the intensive areas of Oregon.

Although not much fertilizer is used at present in eastern Washington and Oregon and in Idaho, Colorado, and Montana, leaders both in the trade and in

experimental work are giving much attention to intensive study of the question of its use. Thus, the use of commercial plant food will gradually spread inland from the coast.

This vast area of the Pacific Northwest presents an abundance of problems—a great variety of soils, crops, and climatic conditions—a far greater variation than exists in the older eastern fertilizer areas. There is need for much work to be done and the workers are all too few. In this spread of the use of fertilizers, the fertilizer men of the Pacific Northwest through their association and the experimental workers in their respective fields are to be congratulated on the efforts they are making to solve some of the problems.

The Price of Fertilizer

During the period from 1880 to 1900 there was a downward trend in the retail price of complete fertilizer. During that period the fertilizer tonnage in the United States approximately doubled,—that is, with the declining prices there was an increase in fertilizer consumption.

During the period 1900-1914 the average retail price of complete fertilizer per ton remained approximately constant. The fertilizer tonnage of the United States was approximately quadrupled during this period.

During the earlier period farm prices as well as fertilizer prices declined. In the latter period fertilizer prices remained constant and farm prices rose. This seems to indicate that the fluctuation in fertilizer tonnage has been influenced more by changes in demand for fertilizer than by changes in the price of fertilizers.

We hear about the price of fertilizer being so high that the farmer cannot afford to use it. According to the statistics above the old law of supply and demand works just as much in the fertilizer trade as it does in any other business.

The Success Habit

Old mother cat knows her kittens and what life demands of them if they escape drowning at the hands of the cat's proprietor. So she teaches them how to be successful mousers.

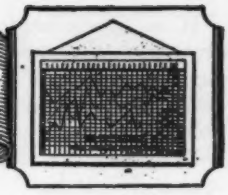
She brings in dead mice for the kittens to practice on. The catlets growl and pounce and stick their teeth into the dead mice with great courage and gusto. In their first fight they come off victors. Which is just what mother cat wants. She wants them to think success, to feel confidence, to fear no mouse.

In our next catchapter the parent brings back not dead mice but disabled mice, so the kittens will have a little, but not too much, resistance. And finally she brings back strong healthy micies for the kittens to try on their piano. By this time the kittens are habituated to success.

Foxes and dogs train their juveniles by the same process; and a puppy untrained is apt to get so badly bitten in its first battle with a rat that forever after all rats look ten times bigger than they are.

Men are like that. They need two or three successes in order to get the success habit and the courage to try.—*Wisconsin Horticulture.*

AGRICULTURAL DEVELOPMENTS



Citrus Culture

IN the new Bulletin 33 of the Porto Rico Experiment Station is given a most interesting treatise on the cultivation and fertilization of citrus fruits. The author, Mr. H. C. Hendricksen, states that fertilization practices prevailing in the Island are not consistently satisfactory or economical. The lack of uniformity in analyses used, the quantity applied, and the time of application have prompted the Experiment Station to investigate critically these aspects of citrus fruit fertilization. Based on a very exhaustive study of this subject, the author makes the following suggestions:

Instead of heavy application of any fertilizer all at once, it is more economical to use specific analyses high or low in nitrogen and potash at at least three different periods. He recommends that 10 pounds per tree of a 6-4-4 analysis be applied in early December and that 10 pounds of a 4-6-6 analysis per tree be applied in March and that a third application of 10 pounds per tree of a 2-6-10 fertilizer be applied in June.

The aim of fertilizaton with this crop, he states, is to mature as early as possible and to attain a high stage of dormancy by early December. This objective is accomplished by the use of a high nitrogen—low potash analysis in December and a low nitrogen—high potash analysis in June.—*E. N. Bressman.*

FORTY-FIVE MINUTES PER ACRE

When wheat was harvested with a sickle and threshed with a flail, from 35 to 50 hours of labor were required for harvesting and threshing an acre with a yield of 15 bushels, according to some figuring done by the United States Department of Agriculture. The introduction of the cradle saved about 10 hours per acre. At present farmers in the Great Plains use from 4 to 5 hours in harvesting an acre of wheat with a binder and threshing from the shock with a stationary thresher; from three to four hours when the crop is harvested with a header and threshed with a stationary thresher; and an average of three-fourths of an hour when the combined harvester-thresher is used.

PASTURE FERTILIZATION IN HOLLAND

The Director of the Department of Agriculture for the province of Manche, northern France, Mr. M. Vezin, reports on a trip through Holland and draws a comparison between the Province of Friesia, East Holland, and his district.

The latter produces 1,620,000 gallons of milk annually. Friesia, on the other hand, produces 2,430,000 gallons. This is due to the great care that is given to pastures, to the selection of animals, to the methods of feeding being used, and to cooperative efforts.

The pastures, just like other crops, are kept in the best of condition. Weeds simply do not exist. The usual application of fertilizers is 53.5 lbs. nitrogen, 110 lbs. phosphoric acid, and 220 lbs. pure potash per acre, which corresponds to 710 lbs. of basic slag (16 per cent) and 440 lbs. muriate of potash given during the winter, and 270 lbs. nitrate of soda and sulfate of ammonia in different applications during spring and summer.

It is easily understood that the growth on the pastures is very vigorous and that 30 cows can be kept in excellent condition and in a very high productive stage on a 74-acre farm. —"Le Phosphate et les Engrais Chimiques," November 15, 1929.

THE ICE CREAM INDUSTRY

It takes the milk of 1,300,000 cows to make the ice cream eaten in this country in a year. There are about 4,000 ice cream factories and they turn out approximately 350,000,000 gallons of ice cream annually.

CANADIAN PASTURES

It is becoming more and more apparent that the judicious use of fertilizers as top-dressing on pasture lands is likely to be quite profitable.

Basing their suggestions on the results of cooperative pasture fertilizing tests conducted last year and upon results obtained in other parts of America and in Europe, the Department of Chemistry at the Ontario Agricultural College recommends the top-dressing of pastures with 300 to 500 lbs. per acre of 3-10-5 or 4-8-6 fertilizer, or with 300 lbs. 0-12-8 or 0-14-6, followed by a second top-dressing, about 10 days later, of 200 lbs. soluble nitrogen salts.

Pastures on sandy or gravelly loam soils benefit materially from fertilizers fairly high in potash. This is especially true where much alfalfa is found in the pasture. High potash fertilizers always increase the per cent of clover in the pasture, while phosphoric acid invigorates the root growth of pasture grasses and legumes.

The fertilizer should be broadcast evenly on the pasture field soon after growth has started in the spring, and preferably after the dew has dried off the grass and clover. In many instances, good results have been obtained by harrowing the pasture, where possible, after fertilizing it. The best results will be realized where the pasture is well drained and where the soil is sweet.—*News Bulletin No. 45, Ontario Agricultural College, Guelph, Ontario.*

THE PRIESTLY SWEET

One of the most valuable new Jersey types of sweet potatoes is the Priestly which was originated in New Jersey as a mutation or "sport." This new variety is a valuable one in nearly all northern growing sections because of quality and yielding ability. In both New Jersey and Iowa it has given remarkable results.

Hal C. Wolford of Conesville, Iowa, one of the largest sweet potato growers in that State, is enthusiastic about the Priestly variety. He says:

"The Priestly has a tendency to produce tubers of desirable shape when grown on heavy soils, where many of the standard varieties produce heavy vine growth with few potatoes of desirable market quality. It also is a long keeper. Retailers and jobbers suffer heavy losses on account of the rapidity with which sweet potatoes decay after being removed from winter storage. A test including eight standard varieties taken out of storage, subjected to various conditions and temperatures, discloses the fact that Priestleys were the last to decay.

"It now appears that the Priestly is the best strain for northern sections where the crop is sold in markets preferring the Yellow Jersey type. This is especially true for Iowa, which uses around 1,000 cars of sweet potatoes annually and produces around 100 cars, or less than 10 per cent of the amount consumed, and where the soil is inclined to be too heavy rather than too light for profitable sweet potato production."—*E. N. B.*

Canada exports over $70 worth of agricultural products per head of population, or products with a total value of $700,000,000.

Feathered Missionaries

(*From page* 24)

A satisfactory poultry house built by a group of vocational boys. The walls are of sun-baked bricks. The wire front and door admit light and air. The roofing thatch is readily available. All these materials, except the poultry wire, can be obtained in any village in South India.

at a pugilist fight. Man's inherent lust for blood is satisfied by the cock fight. Even a heavyweight prize fight often lacks the action and excitement that a good pair of cocks can stage. Thousands of rupees are won and lost in this betting sport.

The lure of the cock fight often stands in the way of poultry reform. Movements are on foot by Government and Missionary agencies to eliminate all the native cocks from a village and restock them with pure breeds from imported stock. Those who follow the fighting game are as loath to give up their prize birds as the New York Yankees would be to sell off Babe Ruth, their prize attraction. Nor do they usually care to trouble themselves to the extent of keeping their gaming pet confined. The result is that such a bird not only continues to perpetuate his kind but also makes life pretty miserable for the more docile, domesticated bird whose breeding has been for the egg basket rather than for the prize fight ring.

In the large cities like Madras, Bombay or Calcutta, there is a sizeable poultry and egg market, but this influence hardly reaches to the thousands of interior villages. The majority of village people who keep a few fowls do so to provide a feast for a visiting

relative or friend. Such village fowls are kept in a most haphazardly fashion. Kites and crows carry off eight of the ten chicks hatched. Those that do survive this natural selection process, become the village scavengers and make their living in that way.

Eggs as an article of food are not yet very widely appreciated in India.

Need Salesmanship

A difficulty in the way of persuading the people of India to get the American habit of "an egg a day" is the fact that the orthodox Hindu is a vegetarian. It takes a lot of persuasion to convince some of these gentlemen that an unfertilized egg would meet the most religious views very acceptably because such "hen fruit" contain absolutely no spark of life. The majority of eggs that are today being used in India are eaten by the Mohammedans and low caste Hindus who really are outside the pale of religious observances. These two classes represent a population of 66 and 60 millions respectively who would be able to consume a goodly number of eggs irrespective of the religious views of the Hindu.

But they also need something of the high powered salesman idea to get them to appreciate the value of eggs in the diet. We are happy to say, however, that changes are coming over India very rapidly, and the attitude toward the lowly hen too is changing along with many other reforms. When the lowly one and a quarter ounce native hen egg matures to the size and quality of the American U. S. Special, it may be more easy to convince people of the desirability of egg consumption.

Poultry enthusiasts are banking heavily on the virtues of cross breeding for the rapid development of the Indian fowl. It is hoped that the prepotency of the Western birds will transmit the desired egg laying propensities while the disease resistance of the Indian fowl may be carried over from the dam's side. Through many years of natural selection,a great deal of disease resistance has been built up in the native fowl, kept as it is under very crude, unsanitary conditions.

It is very doubtful whether the imported, highly bred Western fowl would be able to live under such conditions. The cross bred bird, however, has already demonstrated its value in this respect. Several breeding stations are springing up where splendid pure bred cockerels can be purchased. The improvement over the mongrel is at once very striking. The egg size at once rises at least half an ounce and the egg production is doubled. The offspring too are of a uniform color inherited through the prepotent male bird. Caponizing is recommended for the half bred cockerels.

The breeds that seem to do best in India are the White Leghorn, Rhode Island Red and the Black Minorca, in order of importance. The climate seems to have a degenerating effect so that fresh importations must be made every third or fourth year to maintain the standard. This naturally will be expensive until a more or less indigenous breed may be developed. There is ample room for interesting research work along this line.

India is credited with being the original home of the fowl and as such will doubtless again develop this industry in time to make a real contribution to the feathered world. The climate of South India, never falling below 65 degrees, naturally eliminates many of the western troubles and expense of housing. Even the imported fowls seem to thrive under the sweltering heat of summer, rising to 110 degrees.

There are many unique difficulties as well, for example, snakes, mongooses, crows, kites, petty thieving, diseases and lack of marketing facilities. These will doubtless be overcome in time and India will be on the map supplying a goodly share of the egg demand.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

One of the chief difficulties encountered in the use of commercial fertilizers is the application of fertilizer materials uniformly and at the desired rate of application. This difficulty is largely mechanical. Little or no data were available on comparative drilling qualities of fertilizers or the factors affecting these properties. Fertilizer distributors in this country were designed for the handling of low grade fertilizers. The present trend toward use of more concentrated fertilizers is rapidly making present day machines obsolete. Realizing this condition, the United States Department of Agriculture has quietly conducted investigations with numerous distributors and a variety of fertilizer materials both low grade and concentrated. Results of their findings were recently published in Technical Bulletin 182, United States Department of Agriculture, entitled "Factors Affecting the Mechanical Application of Fertilizers to the Soil." This bulletin is a valuable contribution to our knowledge of fertilizer machinery and drillability of fertilizers.

Soils

"Success With Sandy Soils" (Wisconsin Agricultural Experiment Station, Bulletin No. 416,) largely concerns correct soil management. A. R. Albert and A. R. Whitson very thoroughly discuss the various phases of the proper management of this class of soils, important not only in Wisconsin, but also in many other parts of the country. It is clearly brought out that leguminous green manures, properly fertilized, and liming are the basis on which the sand farmer must work. The authors very logically explain that a green manure crop, in order to be of greatest benefit to the soil, must be well fertilized with potash and phosphoric acid. They point out, that the use of a fertilizer ratio high in potash is very necessary in this type of farming, owing to the fact that legumes require large amounts of potash, while sandy soils are usually very poor in this nutrient.

The control of sand blowing; soil moisture; proper rotations; tillage; adapted crops and their fertilization are all thoroughly discussed by the authors in this publication. Anybody having to deal with sandy soils, certainly will find this bulletin to be a valuable hand-book, and the principles contained therein pertain not only to Wisconsin but to almost any part of the country with sandy soils.

"Soil Sterilization," Univ. of Fla., Agr. Exp. Sta., Gainesville, Florida, Press Bul. 423, *Apr.*, 1930.

"Macon County Soils," Univ. of Ill., Agr. Exp. Sta., Urbana, Illinois, Soil Report No. 45, *Dec.*, 1929.

"Factors Influencing Runoff and Soil Erosion," Agr. Exp. Sta., College Station, Texas, Bul. 411, *Mar.*, 1930.

Crops

Of particular interest this month is Bulletin 344, "Growing Potatoes in Illinois" by the Illinois Agricultural Experiment Station. Although Illinois is not an ideal potato-growing State, it is pointed out that with improved

cultural practices, including selection of seed, disease and insect control, proper cultivation and careful attention to the proper use of balanced fertilizers, a large proportion of potatoes consumed in the State could be profitably grown.

Extensive experimental work has revealed a great variation in the soil requirements for fertlizing elements on the principal soil types. Barnyard manure has consistently given the largest increases and money return of any fertilizer treatment. Sandy, peaty, and clay soils low in active organic matter are known to be deficient in potash, and on such soils is recommended. Because the potato crop is a heavy feeder and must grow rapidly and mature before hot weather, commercial fertilizer is quite generally being recommended and used. The proportion in which the three essential plant foods should be used varies with different soils. The state authorities recommend 500 pounds per acre in the row, or 1,000 pounds per acre broadcast of 3-18-9 for dark colored silt or clay loam; 3-15-12 for light colored soils and 3-9-18 for sandy soils.

"Experiments with Legumes in Alabama," Agr. Exp. Sta., Auburn, Ala., Bul. 232, May, 1930, R. Y. Bailey, J. T. Williamson, J, F. Duggar.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Calif., Vol. XIX, No. 5, May, 1930.

"The California Avocado Industry," Univ. of Cal., Berkeley, Cal., Agr. Ext. Service Cir. 43, Apr., 1930, Robert W. Hodgson.

"Growing Early Cabbage," Conn. Agr. College, Ext. Service, Storrs, Conn., Ext. Bul. 148, April, 1930, Albert E. Wilkinson.

"Vocational Agriculture in Florida," Dept. of Agr., Tallahassee, Fla., Quar. Bul. Vol. 40, No. 2, Apr., 1930, Nathan Mayo, Commissioner of Agr.

"Mushrooms and Their Culture," Univ. of Fla., Agr. Exp. Sta., Gainesville, Fla., Press Bul. 425, Apr., 1930, George F. Weber.

"Louisiana Corn Varieties," La. State Univ., A. and M. College, Agr. Exp. Stas., Baton Rouge, La., La. Bul. 210, Feb., 1930, H. B. Brown.

"Pasture and Forage Crops for Louisiana," Div. of Agr. Ext., La. State Univ. and A. and M. College, Baton Rouge, La., Ext. Cir. 140, Apr., 1930, R. A. Wasson.

Annual Report for the Fiscal Year Ending Nov. 30, 1929, Agr. Exp. Sta., Amherst, Mass., Bul. 260, March, 1930.

Fifty-second Annual Report of the North Carolina Agricultural Experiment Station, for the fiscal year ended, June 30, 1929, Agr. Exp. Sta., State College Station, Raleigh, N. C.

"Planting Rates for Early Varieties of Corn," Agr. Exp. Sta., N. D. Agr. College, Fargo, North Dakota, Cir. 43, May, 1930, P. J. Olson.

"Varieties of Apples for Pennsylvania," Pa. State College, School of Agr. and Exp. Sta., State College, Pa., Bul. 253, Apr., 1930, F. N. Fagan and R. H. Sudds.

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Economics

Virginia ranked first among other states in the production of early potatoes and in the shipment of sweet potatoes in 1929; second in the production of spinach and in shipments of apples; third in the production of tobacco and of peanuts; and fourth in the production of cabbage. The estimated gross farm income from crops, forest products, livestock and livestock products was $216,873,000, compared with $220,122,000 in 1928 and $226,136,000 in 1927.

These facts are presented in "Virginia Farm Statistics, 1929" which has been compiled jointly by the Bureau of Agricultural Economics of the United States Department of Agriculture and the Division of Agricultural Statistics of the Virginia Department of Agriculture. The bulletin is published as Number 7 of the latter department. Data are included on acreage, yield, production, and value of

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Northwestern Peat Soils

An abstract by W. L. Powers

Oregon State College

FOUR different types of peaty soils have been recognized in the Northwest. A profile sample of the soils studied are:

1. Tule and sedge peat from Klamath marshes located in an elevated semi-arid region and having slightly alkaline reaction. The substratum to ten feet down is collodial, diatomaecious, siliceous muck.

2. Woody-sedge peat (a) from Lake Labish and (b) from Wapato Lake in the subhumid Willamette Valley, with a marshy substratum and faintly acid reaction in the upper horizons. (c) Soil from Coquile Valley and (d) from Sandpoint, Idaho, were examined and correlated with this group.

3. Sedgy, acid, muck from near Clatskanie in the lower Columbia river bottom.

4. The fourth kind of peat is brown, acid soil from the coast near Astoria, formed from sphagnum moss and woody matter including slowly decaying spruce wood. The substratum is silty clay loam. A profile sample of raw sphagnum peat from Cottage Lake near Seattle has been analyzed and grouped with this kind of peat.

Earlier fusion and strong acid analyses show these soils are usually high in nitrogen and sulphur and low in potash.

Nearly all these soils contain contributions of mineral material. Volatile matter in the surface layers is found to be fifty to ninety per cent. Reaction values were determined by the use of 1:5 suspensions using the hydrogen electrode.

The net amount of bases, (Ca and Mg) extractable with tenth normal barium chloride is low except with a subsoil overlying the calcareous or marly substratum. The amount of bases so extracted seem to decrease as organic content increases, indicating that material so held in nearly pure peat is very limited and the degree of saturation with bases low. Little data from other investigations are to be found for comparison in this regard.

Water soluble nutrients were determined using five parts of water to one of air dry soil (Seattle soil 10:1) and reported in per cent dry weight. Analyses were made of samples representing each group from fallow pots treated as were triplicate parallel series of two gallon pots employed in planthouse fertilizer trials. Nine to twelve treatments were used, making three to four dozen pots of each kind of peat.

Water soluble potassium in untreated soils from these areas is limited, especially in case of Klamath and of sphagnum peat. All three soils show an increase in water soluble potassium six weeks after treatments with potassic salts, barnyard manure, or calcium carbonate, or a combination containing one or more of these. Analyses repeated after six months using Lake Labish soils showed a general increase in water soluble constituents from incubation in the planthouse in an uncropped condition.

Oats, mint, potatoes, flax and clover have been grown in fertilizer trials with the four kinds of peat in two gallon pots and or on field fertilizer plots. Potassic salts and other treatments mentioned which have increased water soluble potassium generally result in increased yields. Full efficiency of potassic salts was not obtained except in the presence of a fair supply of nitrate.

Trials indicate that potassium sul-

fate will give slightly larger yields and a higher quality of product than potassium chloride.

The length, strength and yield of flax fibre has been markedly increased through the use of potassic fertilizers using Lake Labish soil. In one case the fibre yield was trebled. Cooking quality and dry matter content was highest with potatoes grown with the aid of potassium sulfate and a large number of pressure tests with automatically registering equipment clearly indicates the potatoes from this lot were slightly firmer as judged by two seasons results.

The study is being continued and effect of imperfect drainage, liming and soil inoculation are projected, in which the Department of Bacteriology is cooperating in measurements of carbon dioxide evolved and in studying the microorganic activity as effecting the soil solutions of these peat soils.

Drainage and usually supplemental irrigation are desirable for moisture control in these soils.

The marly substratum and well decomposed condition of Lake Labish peat and the mineral fraction explain in part its established productiveness, while the low concentration of potassium indicates increased use of the same. The raw brown woody acid peat is suited for production of grasses and cranberries and with lime, manure and potassic fertilizer may be used for truck crops.

Klamath marshes with deep drainage and supplemental irrigation are mainly suitable for forage crops. In time such hardy vegetables as the climate will permit and the market require, may be grown thereon.

Michigan Pastures

By A. J. Patch

East Lansing, Mich.

METHODS of handling pasture lands which more than double the amount of feed produced per acre are indicated in the experimental field trials carried on during the past two years by the soils department of Michigan State College. Amounts and kinds of fertilizers, lime, and plowing and reseeding were tested on blue grass pastures in 1928 and 1929.

All three methods of increasing the growth of grass in the pastures were effective. Most of the experiments were conducted on fields where the soil was a fairly fertile loam with a clay sub-soil. One trial made on hilly, sandy land showed the same type of response to better practices, but the increase obtained in grass growth was much less than on the good soils.

Applications of ground limestone gave no increase in grass growth the first season. The material apparently fails to become available the first season when it is applied on soil as a top-dressing. It probably will give results later.

When one and three-fourths tons of hydrated lime were used as a top-dressing, a 60 per cent increase in grass growth was obtained. This lime becomes quickly available for the plant's use. The grass grew earlier and stayed green later in the fall than in parts of the same pasture where no lime was used.

Remarkable increases in yields of grass were secured through the use of fertlizers with and without lime. Several analyses of complete fertilizer and also the different fertilizer components separately were used in the tests. Complete fertilizers were the most successful in stimulating growth, but the superphosphates appeared to be aspecially valuable in promoting the

growth of clovers in the pastures.

Three hundred pounds of fertilizer were the standard rate of application for these trials. Analyses of 5-12-4 and 10-12-4 were the best aids to better pastures.

Less Over-grazing

In the Kalamazoo county field the increases in growth secured were: with hydrated lime alone, 60 per cent increase; with 300 pounds of 5-12-4 alone, 102 per cent increase; with the same amount of 10-12-4 alone, 116 per cent increase. When both lime and fertilizer were applied the results were a 150 per cent increase in grass growth with 5-12-4 and lime, and a 174 per cent increase for 10-12-4 and lime.

Plowing pastures and reseeding them with a good grass mixture gave good results, but this type of renovation is impracticable on hilly land where breaking the soil will lead to excessive surface washing before the new seeding gets a start. The grass seed was sown with a nurse crop of oats in these tests.

The experiments were conducted on pastures which had become run-down through overgrazing and this condition had encouraged the growth of weeds. If these become troublesome, the members of the soils department recommend that they be mowed before they go to seed. The increased growth of grass tends to keep the weeds down and the pasture is not so apt to become damaged from overgrazing.

A means which increases the carrying capacity of an area from two cows to five cows is an important aid to many small dairy farms where the lack of pastures has been the limiting factor in enlarging the herd. Summer butterfat prices have been high enough in the past few years to make the production of more pounds a profitable venture. The use of lime and fertilizers as spring top-dressings will lead to larger profits.

Squash or Pumpkin?

By E. N. Bressman

Lincoln, Nebraska

THERE is a great deal of confusion in regard to names of both pumpkins and squashes. In fact most growers are unable to distinguish between these two vegetables.

Pumpkins are commonly called squashes and squashes are commonly called pumpkins. County fairs, State fairs, and other exhibts frequently incorrectly classify pumpkins and squashes. Oftentimes, a judge places a squash first in a class of pumpkins and many times a pumpkin is given the blue ribbon in the squash class.

It is of interest to know that there is a simple means of distinguishing between the two. The easiest way is by means of the stem which holds the specimen to the vine, since a part of this stem is usually attached to the vegetable. On pumpkins, according to the Iowa Experiment Station, this stem is hard, woody, and furrowed. On squashes the stem is soft, and usually rounded and enlarged where it is attached to the vegetable.

A recent publication by the Iowa Experiment Station, states that there are two groups of pumpkins and one group of squashes. They find that one group of pumpkins is easily crossed on the squashes, but that it is almost impossible to cross the other group of pumpkins with squashes. In this way they account for the large difference of opinion in regard to the crossing of these two vegetables. The study carried on by the Iowa Station included 98 pumpkins and squashes.

Wisconsin Corn Fertilizers

GIVING the corn crop a "shot" of quickly available plant food in the form of commercial fertilizers has more than justified the expense, according to C. J. Chapman, soils specialist at the Wisconsin College of Agriculture. The application of commercial fertilizers by means of a special attachment on the corn planter gives that crop three advantages over the non-fertilized crop, he claims.

It starts the crop off quickly in the early spring; advances the maturity in the fall from a week to ten days, which may be the margin needed to beat the first killing frost; and, at the same time, it increases yields and improves the quality and feeding value of the crop.

Following the recommendations of the College, and as the result of their own experience and observations, Wisconsin farmers will use approximately 18,000 tons of commercial fertilizer on the corn crop in 1930. For the prairie soils, the use of straight superphosphate or mixed fertilizers carrying a small amount of nitrogen and potash in addition to the phosphate is recommended. Such mixtures as 2-12-6, 3-18-9, and 3-14-6 have been used with excellent results, Chapman states.

For the lighter colored clay and silt loam soils, he advises the use of fertilizers carrying a little more nitrogen than those used on the prairie soils, or such mixtures as 4-16-4, 5-15-5 and similar combinations.

On sandy soils, bottom mucks, and peats the fertilizer for corn should be relatively high in its potash content. Mixtures of 2-8-16, 3-9-18, 3-12-12, or even 0-9-27 and 0-8-32 combinations will cover the requirements.

Stable manure or legume residue should, however, be used as the chief source of plant food for this crop, since corn is a heavy feeder on nitrogen. "Commercial fertilizers for corn applied in small amounts of 100 to 150 pounds per acre cannot be expected to take the place of a liberal application of manure, but should be used as a supplement to it," he concludes.

Bill Heintz's 4-8-8

(*From page* 20)

It might be explained further that assistant county agent Seaton had, in this same neighborhood, 12 potato club members last year and one of the requirements for membership was that each member must use fertilizer, a 3-12-4, on his potatoes. But when the elevator manager was questioned, he had recorded no increase in sales of 3-12-4 over other years.

To this, the county agent made this comment: "Bill's demonstration showing the 4-8-8 to be the most profitable fertilizer combination must have been much more convincing to the farmers of the neighborhood than the plots of the potato club members who had used the 3-12-4."

The man upon whose farm a demonstration is located is a very important factor in disseminating the results. Naturally, the first thing is to demonstrate that fertilizer turns the trick, but a man who is a natural leader in the community will get this information into circulation quickly.

Prophesying Prices

(*From page* 19)

there has been a big drop in the prospective yield and they retire to the rear of the barn and kick themselves vigorously for selling.

The fact that the weather of July does not manifest its damage to the potato crop until late in August is now being recognized by the crop reporting service of the Department of Agriculture. As a result it is likely that before many seasons we will have our crop reports dished up for us all seasoned to taste with data gleaned from the thermometer, the barometer, and all of the allied tools of the weather man. Charts and formulae are in the process of making, and preliminary estimates made the past two years with the help of these came extremely close to the final yields.

For example, Verne H. Church, Agricultural Statistician at Lansing, Michigan, reports that weather conditions up to September 1, 1928, would have forecast a potato crop for that state of 115 bushels per acre and that the actual yield was 117 bushels. Frederich W. Waugh and Chester D. Stevens, statisticians in New England, hit the 1928 Maine yield within six-tenths of a bushel per acre as early as September 1. When one considers, as the American Potato Journal points out, that the Maine yield has ranged from 125 to 315 bushels per acre, an error of six-tenths of a bushel per acre is scarcely large enough to be mentioned.

Statisticians have come in for lots of razzing. Commander H. H. Frost said recently that there were three kinds of lies: lies, damnable lies, and statistics. But the study of statistics is going forward with an impetus never before achieved. These preliminary studies indicate that formulae made up from weather records and resultant yields may be the most valuable price forecasting aids we have. This article has dealt with potatoes, but the same methods will apply to other crops, to a certain degree.

Skilled Kansas wheat observers may at some future date look over the crop and estimate it as 5,000,000 bushels short, while a young man in Washington, D. C. might differ by predicting it to be 10,000,000 bushels long. The latter guess will undoubtedly be the better one due to the fact that it will be fortified by accurate weather data correlated with yield figures for more than 70 years. The up-to-date Idaho potato grower may remark optimistically to his wife across the supper table: "Well, Martha, I see by the thermometer that spuds went up 35 cents today."

Banking on Alfalfa

(*From page* 18)

tion of prizes for some worth while effort or achievement.

The Barton Bank took him up on this, and asked him to suggest something, so he fortified himself with the Agronomy Specialist and the County Agent and placed alfalfa before the bank directors. The three-year contest, with separate prizes for each year, is the result.

As mentioned previously the prizes for each year are based on the 1931 alfalfa seeding. The second and third sets of prizes contain nothing unusual. They are awarded to the best first and second-year showings of alfalfa, and are based on standard scorings for yield, evenness of stand, free-

dom from weeds, etc. The first edition of the contest is outstanding in that it is based on soil preparation from the spring of 1930 until the alfalfa is seeded in 1931.

In featuring soil preparation as an essential of alfalfa, the Barton Savings Bank and Trust Company seems to have hit at the root of the matter. Although Orleans county is a highly specialized dairy county and alfalfa is recognized as the "Queen of Dairy Feeds," the alfalfa acreage is negligible.

Removing Obstacles

Much of the land, especially on shallow soiled hillsides, is not adapted to its use, but nearly every farm has areas which seem suited to this crop. The chief obstacles to its acceptance seem to be correction of soil acidity, control of the ever-prevalent witch grass (quack grass), and the preparation of a better seedbed than is the common practice of the county.

Advance reports from the contestants seem to indicate that these points will be well taken care of. Soil acidity is being corrected by liberal applications of lime, several of the men using more than one application to insure thorough mixing with the soil. One man has a theory of soil humus as a corrective for soil acidity which he is backing against lime, but each has the idea of having sweet soil by seeding time next year.

Witch grass is receiving a variety of treatments, which include a summer fallow with intensive cultivation, smother crops, and cultivated crops. Probably the widest variation in methods occurs in the eradication of this weed and in the choice of crops for 1930. These varying crops and methods, of course, have considerable bearing on the fertilizer practice being followed.

Dr. E. Van Alstine, State Agronomy Specialist, and the County Agent have dual functions in this contest, in that they were selected as judges by the bank and are looked to as advisors by the farmers. In order to be fair to both positions, they have provided suggestions and information by letter and have been firm in leaving the choice of methods to the individual contestant.

Careful records of each field are being kept so that the soil treatments for the winning fields may be given full publicity at the close of the contest. These reports include history of the field, soil tests at stated intervals, detailed records of each type of soil cultivation, fertilizer and lime applications, kinds and yields of first year crops, etc.

This Banker-Farmer project has stirred up considerable interest among a group of farmers who are extremely skeptical as to the possibilities of growing alfalfa.

Reviews

(*From page* 46)

the principal crops of the state, also the number and value of livestock by counties, with comparative data for earlier years. Such data are of value to anyone interested in the trend of agricultural production in the State.

"Piedmont Farm Business Studies," Agr. Exp. Station, Clemson College, S. C., Bul. 264, March, 1930, *W. C. Jensen and B. A. Russell.*

Insects

"Insect Pests of Trees and Gardens," Agr. Exp. Station, Fargo, North Dakota, Cir. 42, Apr., 1930, *J. A. Munro and Hazel W. Riddle.*

Diseases

"Black Spot, Powdery Mildew, and Brown Canker of Roses," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 426, Apr., 1930, *William B. Shippy.*

"Diseases of Sweet Potatoes in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 212, Mar., 1930, *Geo. F. Weber and Erdman West.*

"Zinc Chloride Treatment for Pear Blight Cankers," Univ. of Cal., College of Agr., Berkeley, Cal., Agr. Ext. Cir. 45, June, 1930, *Leonard H. Day.*

A Master Farmer

(*From page* 17)

tomatoes per acre, 75 to 80 bushels of corn, and 4 tons of sweet corn per acre.

Several years ago the County Agent interested Mr. Reynolds in white sweet clover. This season his 65-acre field of sweet clover is supporting 47 head of cattle and 12 horses and they can't keep it down. He is the only farmer in the community with plenty of pasture.

Up-to-date machinery is used on the Reynolds Farm.

The fine Holstein herd on the farm has been built up through six tuberculin tests. Several losses were encountered at first but now he has a tuberculin free herd that will average about 8000 pounds of milk flow per animal. The herd is housed in a dairy barn, that is equipped with up-to-date stanchions, automatic water fountains, mechanical milkers, and an isolated milk cooler, all complying with health regulations. The silos, granaries, the feed-mixing room and the hay loft for the 30 acres of alfalfa are all conveniently located.

In addition to operating the farm Mr. Reynolds has found time for public activities. At the present time he is taking an active interest in the wheat marketing Act, and is a director of the Eastern States Farmers' Exchange. He has a daughter who is a graduate of Michigan Agricultural College and a son engaged in the farm machinery business at Middletown.

Mrs. Reynolds keeps a cheerful home and where one always feels welcome. Their love for the farm is exemplified by the clean, neat appearance of the farmstead. Mrs. Reynolds has a flock of 100 fine young Bronze turkeys in which she takes great pride. There is also a flock of about 200 white leghorns on the farm.

Mr. Reynolds visits the Delaware Experiment Station occasionally for information and new ideas and he cooperates with the Station to obtain information. The Department of Agronomy has been conducting wheat variety tests on his farm for four years and the seniors from the College of Agriculture visit his farm frequently to study his methods.

A part of his herd.

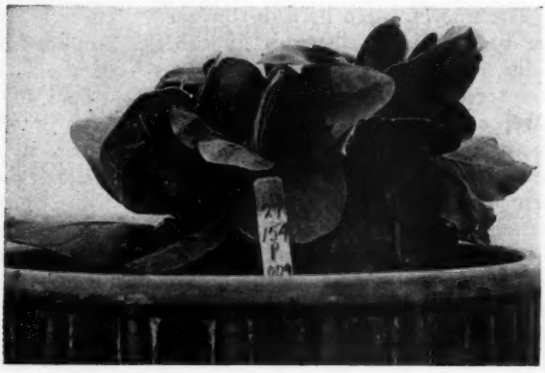
X-rays for Plants

(*From page* 14)

souri has been at work for several years with the X-rays, and as a result has speeded up many hundreds of times the rate at which improved varieties of grain, vegetables, and fruit can be developed. Six thousand progeny, or families of young barley plants from X-rayed crops are growing on the experimental plot under his care. In these groups the outgrowth of heredity has been violently influenced by exposure to a powerful X-rays.

Dr. Stadler expects to find new traits of growth, new qualities of grain, new rates of growth and ripening—in fact, as great a number of mutations as he could have expected in his entire life under the old system of patient selection and development of the rare or occasional mutations in which Nature's processes were undisturbed.

The X-rays, once a curiosity, then a medical tool, is to become a useful source in agriculture. The farmer, perhaps uninterested in its previous development, may soon have the benefit of its power in the results produced, while the millions of consumers will have new foods. They may, incidentally, find it necessary to learn all over again the elementary lessons in botany, nature study, and natural science.



A pot-grown tobacco plant produced by the union of X-rayed sex cells. Note very dwarfed with misshaped leaves and no production of flowering shoots.

Diet *vs.* Drugs

(*From page* 26)

back to this field again. The stunting of the plants and firing of the leaves indicate trouble. The nitrate test will be negative, showing insufficient nitrates. The chances are that the potash deficiency test will be positive, though perhaps not heavy. But, remember that a moderate test in a stunted plant is much more serious than the same test in a large plant.

Always test the soil for acidity. In an acid soil I would always suspect phosphate deficiency with stunted plants. Under the same conditions on an alkaline or neutral soil I would suspect potash deficiency.

To better and more easily adapt corn to the soil, the next great step, and probably the most important step, is field selection of seed corn. In almost any field of corn there are always some plants that produce better

developed and better matured ears than the average. Where a farmer has practiced field selection for years, such plants are easily found. This fact in itself is proof enough of the truth and value of this practice. Choose the well-matured ears on vigorous healthy stalks. Do this just before a killing frost. Pick the plant with ripe husks on green stalks and more important still, this plant should stand in a full stand hill, not alone.

The vigorous plant with a well-matured ear is a plant that has obtained from the soil all the necessary plant foods. This plant possesses that intangible something we term disease resistance, for want of a better name. The seed of the plant will carry much of this resistant character.

The continued selection of such plants is the best way to overcome root rot. It supersedes testing and treatment though it should never entirely replace them. Such plants will also greatly simplify the fertlizer problem because they are best able to utilize the fertilizer that the grower can afford. The poor, weak plants will respond to fertlizers but the strong plants will respond better. It is always easier for the doctor to prescribe a diet for the healthy, hearty eater. So it will be easier for the corn doctor and for the farmer to use the correct fertilizer on the strong plant than on the pampered, weak ones.

Weed Killers

(*From page* 27)

The first application of the chemical will kill the tops and these should be raked and burned about three weeks after the application of the chemical. When the new shoots are about six inches high, a second application of the chemical will be necessary and a third may be advisable in many cases. If plants are allowed to come into bloom they should be cut, raked, and burned and the new shoots should be sprayed when six to eight inches high.

If only one application is to be used, the best results will be secured on Canada thistle when the weed is in the bud in June or late in May when the plant is about 12 inches high, according to Mr. Porter.

Sodium chlorate in the steel or iron drum is relatively harmless. When dust or organic matter is mixed with the chemical it becomes highly inflammable. Clothing, wood, or other materials when soaked with the chlorate solution may be set on fire easily by friction and often explode. A person walking through a sprayed field may find himself suddenly surrounded by flames. One area in Iowa sprayed at the rate of 12½ quarts per square rod caught on fire spontaneously on a hot, sunshiny day.

Spray machinery should be well painted, as should the wagon-boxes in which the chemical solution is hauled. Clothing saturated with the solution should be washed carefully before being worn. Spray pumps should be cleansed thoroughly if they are to be used for other purposes, for a little of the chlorate will damage fruit trees and shrubs.

Calcium chlorate, according to preliminary tests, will kill weeds if used in a strong enough solution, but is not as effective pound for pound as sodium chlorate. However, it has one advantage in that chemists say that it absorbs moisture from the air and is less likely than the sodium chlorate to be explosive on plants.

Sodium chlorate is not considered poisonous to livestock although tests at the Minnesota Experiment Station have shown that cattle given the chemical in capsules may become sick.

The safest plan would be to keep livestock off the sprayed areas for two or three weeks, according to Mr. Porter.

Both sodium and calcium chlorate may be secured at from 9½ to 12 cents a pound. This makes the cost per acre, if 100 gallons to the acre are used, about $10 or $12 for one application.

Under Glass

(*From page* 8)

tomatoes grew unusually well, but lettuce was injured. More leaching or the use of additional manure to tie up the soluble salts will be needed before lettuce will grow well on this soil.

Sub-irrigation of the soil through these tile lines is possible and practical. By using such a system of irrigation the surface inch or so of soil can be kept reasonably dry. Water can be brought from below. This method would aid in the growth of a larger root system. It is unusual, but sometimes such reverses of the normal procedure are very much better than the established way.

Drainage of the greenhouse soil would be greatly improved with the installation of such a system of tile lines. The grower obtains control of soil drainage, soil insects and diseases, and excess soluble salts and makes it practical to sub-irrigate.

Plant growing methods used in producing greenhouse lettuce, tomatoes, and cucumbers are fairly well established. Tomato plants are produced in six weeks, cucumbers in four weeks, and lettuce in three to five weeks depending upon the season of the year. Not so many years ago it was thought that plants needed age before it was safe to set them in a permanent location. Now it is proved accurately that younger plants withstand the final transplanting with less check to their growth rate.

Tomato plants produced in four to six weeks from seeding can be set in the greenhouse 10 days before the blossoms open. Plants with more developed flowers frequently are forced to shed them because of the shock sustained in moving to the final location. Tomato seeds are planted in rows in flats. The rows are three inches apart and the seeds are placed six to the inch of row. As soon as the first true leaves appear, the seedlings are shifted to 4-inch pots. From these pots they are moved to the greenhouse soil.

Cucumber seeds are sown in rows in flats, and just as soon as the young seedling is large enough to hold between the finger and thumb, it is lifted and placed in a 4-inch shallow pot. From this pot the plant goes to the greenhouse soil about the end of the fourth week or when it is six inches high.

Lettuce will reach transplanting size in about seven days. The seedlings are placed two inches apart each way in flats, and after two to four weeks the plants are ready for the final shift.

In past years a good many plant growers lost seedling plants because of a disease called "damping off" or "wire stem." The organisms causing this trouble are now killed by soil sterilization or else the upper one-half to one inch of soil is kept dry to inhibit their growth. The several soil organisms causing damping off live in that part of the soil and cannot exist there if it is too dry. Planting seeds in rows and stirring the soil between the rows immediately after a good watering will aid in this control.

The same principles which govern soil preparation out-of-doors apply to the greenhouse soil. Organic fertili-

zers are plowed under in such a way that they will be distributed as evenly as possible through the upper eight inches of soil. A layer of manure between the surface soil and the subsoil is just as detrimental here as elsewhere.

Decaying organic matter in the soil requires the action of bacteria and they in turn require nitrogen. If the decaying process is rapid, the available supply of nitrogen in the soil may be almost entirely diverted from the growing crop to the job of feeding the bacteria, for their power of gathering nitrogen is greater than that of the plant roots. When this happens, the most effective remedy is the application of available nitrogen as a top-dressing. Two hundred pounds of some nitrogen carrying chemical can be used per acre.

Cultivation in the greenhouse has three objectives. They are weed-killing, covering up soil cracks, and keeping the surface soil loose. Shallow cultivation just often enough to accomplish these three objects is all that is needed. Mulching a greenhouse soil with organic materials is a very costly business and the cost far offsets any advantage the system may have. A reduced yield usually is the result of mulching greenhouse soils with organic materials.

Fertilizing Methods

Normal conditions require the use of nitrogen, phosphorus, and potassium in chemical form to supply the needs of a greenhouse crop. Of these three elements only nitrogen can be leached from the soil. The fixation of phosphorus and potassium by the soil occurs within a week or so of the time they are applied. Knowing this, the grower can obtain the maximum results by mixing the phosphorus and potassium fertilizers with the soil in such a way that they will be fixed where the plant roots will be most likely to find them. The roots of a greenhouse vegetable are most abundant in the first six to eight inches of the surface soil. Cultivation prevents root growth in the upper inch or two of soil.

Since available nitrogen is readily lost from the soil unless plant roots are present to take it up, the most practical way to apply it would be as a side-dressing in amounts sufficient to meet the needs of the plant for a short period. Another application could be made about two weeks later and in fact as often as may be required. The effect of nitrogen on vegetation is easily seen, and the intensive vegetable grower knows how to look for nitrogen starvation symptoms.

The method of fertilizing the early greenhouse tomato crop developed at the Ohio Agricultural Experiment Station calls for the application of manures and chemical fertilizers at such a time that there will be very little available nitrogen during the short, dark, cold days of winter and early spring. If too much nitrogen is present in the soil during this time, the tomato plants grow large and soft and as a result the blossom buds may drop before they open or the fruits may fail to develop. The loss of one or two bottom clusters means a good many dollars even in a small house.

The program calls for the application of 25 tons per acre of well-ripened manure to keep up the organic content of the soil. This manure, plus 1,000 to 1,500 pounds of an 0-12-24 per acre, is applied in preparation for the fall crop. The use of sulfate of ammonia as a top-dressing is begun the following spring as soon as the early tomato crop has set two clusters of fruit. From 300 to 350 pounds per acre are applied every week or two during the bearing season. Superphosphate induces large root systems and early ripening, and potash produces high quality and contributes somewhat to disease resistance.

Such a heavy nitrogen feeding resulted in earlier maturity. When soils lack in phosphorus or potassium

this would not hold true. The size and number of fruits was increased more than 18 per cent. Nitrate of soda gives equally good results and is quicker acting, but it leaves a residue of sodium in the soil that is very injurious to greenhouse crops when the concentration becomes high enough. This can be washed out as already described.

This fertilizer program meets the requirements of the other crops grown the same year as far as phosphorus and potassium are concerned. Cucumbers need nitrogen at frequent intervals during their bearing period. Perhaps the only danger from the use of such a heavy nitrogen feeding program occurs during periods of short cloudy days when the amount of light is reduced. There is also danger in applying nitrogen before the plants begin to set fruits. It is during bearing and bright, warm, long days that nitrogen is most needed. Cucumbers need even more nitrogen than tomatoes. The same top-dressing program used for tomatoes would meet the needs of the cucumber crop.

More trouble is caused by overwatering greenhouse tomatoes, cucumbers, and other crops than by an insufficient supply. The plants' needs for water change with the age of the plants and with changing seasons. It is safe to say that plants need water enough to keep them from "flagging." Whenever a plant gets dry enough to wilt it is likely to be damaged. Flagging is a term used to indicate the pre-wilting condition.

A soil over-supplied with water reduces the amount of root growth made. Smooth, high quality fruits are obtained by watering sparingly and only as needed. The more water given, the faster a plant grows and the rougher the fruits will be, especially in the case of the tomato. Early in the development of a plant and during cloudy, short days it is best to be very stingy in the matter of watering. In some cases a soil well supplied with water-holding organic matter can do without water for four or five weeks. The grower is always on the lookout for the "flagging" of the leaves, however.

Lettuce is a cool season crop and can be grown successfully at night temperatures of 40 to 50 degrees F. Its ability to grow well at such low temperatures is one reason it is such an important greenhouse crop. These temperatures are not safe without ventilation. Fresh supplies of air are needed and ventilation is almost as important as temperature.

Tomatoes do best with night temperature of 55 to 58° F. Rough fruits are likely to be more numerous at higher or lower night temperatures. Lower temperatures slow up the growth rate too much and higher temperatures cause the plants to grow rapidly. Such a rapid growth may result in a smaller number of fruits.

Importance of Light

Cucumbers require higher night temperatures than tomatoes. From 65 to 70° F. are needed at night. Day temperatures for these crops will average 10 degrees higher than night temperatures. On cloudy days the night temperatures can be used.

Without light, greenhouse plants would have little value. Green color in plants is due to the presence of chlorophyl and this in turn uses energy from the sun. Carbon dioxide from the air passes through leaf openings and is absorbed by the leaf tissues. Nitrogen, phosphorus, and potassium as well as seven or more other elements are brought to the leaves in water solution. A reaction takes place between these elements and the carbon and oxygen in the carbon dioxide. The result is the formation of sugars, starches, and protein materials. The more light the faster the reaction can be.

Normal plant development occurs when there is a balance between the amount of light and the amount of these several elements, nitrogen in

particular. Unless there is this balance between the nitrogen furnished by the soil and the sugars and starches developed in the leaf by the action of light on the chlorophyl, the plant growth will be soft and unfruitful. Nearly all growth will be vegetative. The solution is to control the soil's supply of nitrogen so that during periods of slow growth there will be only limited amounts available.

More and better experimental work is needed to insure the grower of continued improved conditions. A great deal has been done, but there is plenty of opportunity remaining. The art of agriculture is now reinforced by the science of agriculture, but 300 years is a relatively short time. The next few years will no doubt produce as many real scientific contributions as have been made to date. Many of the observations made concerning the greenhouse way could be examined with profit by any grower.

Getting Joiners

(*From page* 10)

high groups attended one or more dances during the year, and 60 per cent attended one or more card parties, compared with about 35 per cent who went to dances, and about 50 per cent who went to card parties.

All told, the chief symptoms of ability and interest in rural organizations seem to be those pertaining to certain forms of educational facilities such as periodicals taken, books in the home library, and time spent in reading and radio auditing. At any rate, they are most closely associated with organization activities. Church attendance bears little or no relation to other group interests or to number of meetings attended. Also the size of the family and the ages of the different members seem to have no particular relation to the interest the family feels in organizations.

J. H. Kolb of the Wisconsin College of Agriculture, who has directed this study says:

"To a large extent the organization situation in the selected school districts seems to be shaped by the less tangible factors pertaining to the history, traditions, and culture of the neighborhood or the community. Among these are early settlement and nationality backgrounds, neighborhood groupings, and stimulation in the way of suggestions and promotion from outside agencies.

"The people in the high organization districts appear to have had for a long time certain common objectives and tendencies to work together. In the low organization districts they have had little in common and have not learned the art of cooperating with each other in groups. With less experience in group activities as a background on which to build, the low organization districts usually get less stimulation from outside agencies than do the districts which are already highly organized.

"Apparently this makes for possible overloading with some families in well-organized localities and provides little or no organizational opportunity for families in poorly organized localities. Studies of several families also suggest that those families who are assuming the leadership and sharing the support of organizations in highly organized localities can not be expected to assist in the promotion of additional organizations.

"On the other hand, these case studies show a desire and a need for organization opportunities in poorly organized districts and indicate the presence of potential leadership there to direct them, under sufficient counsel and guidance from organization promoters."

The Inquiring Mind

(*From page* 30)

normal growth of rats. It is plentiful in the green portions of plants and also in the softer portions of beef fat, cod-liver oil, carrots, and sweet potatoes." (Feeds and Feeding).

At Wisconsin, Dr. McCollum, in conjunction with Professors E. B. Hart and J. G. Fuller also did notable experimental work relative to the role of inorganic phosphorus in the nutrition of animals; with Professors Hart and G. C. Humphrey, work on the role of the ash constituents of wheat bran in the metabolism of herbivora; alone, relative to the nuclein synthesis in the animal body; with Professor H. Steenbock, on the nutrition of the pig; with Hart, Steenbock, and Humphrey, regarding the physiological effect on growth and reproduction of rations balanced from restricted sources. In 1918, Dr. McCollum issued an important circular entitled "Hints on What to Eat During the War."

The role of the rat in the varied research undertakings of Dr. McCollum has been invaluable. "Mac and the rat" have become a veritable tradition. The Doctor has used the previously loathed rodent by the thousands and today is employing the lowly animal as busily and effectively as ever at Johns Hopkins University.

The number varies with the nature of the work and that varies from year to year. We are informed by Dr. E. Becker, of Dr. McCollum's laboratory, that the rats used number between 2,000 and 3,000 a year, and some years probably as many as 10,000. His colony has been in existence for about 18 years, so that approximately 90,000 to 100,000 rats have been bred and used.

Guinea pigs were also used for scurvy work over a period of about three years. A pair of prairie dogs were sent to the laboratory and their offspring were used for work with scurvy. These animals, like rats, are immune to scurvy. For a while, pigeons were used in order to determine the difference between the Vitamin B requirements of birds and mammals.

Always Helpful

The rats now employed are the best that can be grown. They show the direct results of ideal environment, good diet, and careful selection for mating. They are housed in a room about 40 feet x 30 feet x 15 feet, with 24 windows and eastern, southern, and northern exposure. Strictly sanitary conditions are maintained. No disastrous epidemic has occurred. The rats are closely observed and weighed at short intervals. Inferior specimens are discarded, as are rats with sore eyes, mangey coats, or bloody noses. The breeding rats are fed milk daily and fresh raw, green vegetables three times a week, in addition to a balanced ration of cereal grains and a mineral mixture.

Well-fed female rats are quite ferocious in the care and protection of their young. They build nests of excelsior and wood chips, provided in the cages, and remain in the nest nursing their young and vigorously protecting them throughout most of the day, until the young are about 19 days old. By that time they have a full coat of fur, their eyes are open and they take food and water in addition to nursing their mother.

Dr. McCollum is interested in all phases of nutrition. He knows the diets and dietary habits of people throughout the world, as well as of animals. He was one of the first to

realize the value of a well-balanced diet for humans, as well as for farm animals, and tells of all of these things in his illuminating book, "Food, Nutrition, and Health."

Of him a colleague has well said: "He is one of those very unusual people who can always find time to help someone else over the rough places. Whether it is a problem of chemistry or nutrition, or just one of those every-day problems common to us all, one can always be sure of a sympathetic hearing from the man who has not only made an outstanding success of his work, but who enjoys life and knows how to live."

All of us, I feel sure, will heartily wish this eminent man, of the inquiring mind and seeing eye, many more years of successful, useful endeavor and happiness.

Picnics

(*From page* 4)

The inscription will read, "Go to the ant, thou sluggard, consider his ways and beware." Such a tribute to American optimism and courage should stand beside the granite horrors dedicated to our soldiers in every court house park. The duties of peace are often just as hazardous as the arts of war. Send in your donations to No. 19 West 44th street, and state your preference for hard or soft boiled. The contract may be awarded to Gutzum Borglum.

I TALKED with a farm draft horse the other day, one of the Percheron family who knows his bran and gad flies. He remarked with firmness that he reckoned the auto had come to stay, but he was not so sorry about it, especially on Sundays. His mother told him that back in the old family chaise period they used to hitch her up for long drives with heavy picnic baskets. After she had been toiling behind the plow or cultivator all week it seemed as though Sunday ought to be a mare's vacation. So he felt as though his kindred owed the motor car a deep debt of gratitude for relieving them of so much fuss and muss on the Sabbath.

"They used to kick if a little oats got into the cake box," he said, "but now I wonder what they say with the alemite grease in the salad."

Then I got to thinking how the auto has made such an interchange of town and country relations in the summer time. The folks in the country spend their Sundays with picnic lunches washed down with pop at the park resorts or in the city recreation gardens. The city people go in the other direction and get their fill of fresh air, green pastures and beggar lice on their pants. Once upon a time you could go out in the country on Sundays and get invited to dinner, if you timed your arrival nicely. Nowadays you must take your own picnic provender because nearly every farm house is closed with a wolf hound stationed at the gate. The great American habit of going somewhere to see things has enlarged the trade for the delicatessen stores and made the farmer as great a gadder as any of the Gideons. As he is a hefty eater by occupation and inclination, it takes a keen steward to satisfy his picnic requirements.

There has grown up another commercial side to agriculture arising from the wanderlust of the motor mad city people. This is the road side stand, operated by some farmer or by a shrewd town trader who uses the watermelon patch and the silo as an inviting background. Upon close inspection you generally find he carries more goods sold in a drug store or

candy shop than products of the soil. But the growers who display deleted milk and fumigated apples have generally cashed in fairly well in my state if they began to issue advance warnings half a mile down the road in either direction.

SEVERAL years ago one could have picked out a real dirt farmer behind such a counter and you could patronize him with zealous interest in agricultural welfare. But now things have changed, due to so many picnics. The only real way to detect the true identity of the rural salesman is to ask him if he sells oleomargarine. His mode of reply will be your answer.

Have you considered the effect of picnics on the great American complexion? Tan and sunburn was once the distinguishing mark of the bucolic resident, or the sole possession of the Italian laborer or the Irish policeman. Universal excursions under the burning sun to golf courses and picnic haunts have erased the facial differences between rural and urban dwellers. Only last week a bronzed young village sheik was spotted by our party as "the president of the local bank" because the clerks in the chain store wouldn't have so much spare time on the fairways. The hired man and the rah-rah boy are the same under the skin and on it, too. I am elated that the vitamin theory, ultra-violet rays and all that scientific stuff has come to cheer the hearts of those who sell picnic kits and second hand Fords.

The embattled farmer is, however, torn between the call of the wild and the necessity of staying home to protect his property. Modern auto parties afield are ruthless. So he doesn't know whether to go to the park to eat lemo and peanuts or remain on deck to watch his lares and penates.

My state legislature, still under the partial dominance of Granger threats, passed a rigid trespass law that had more teeth in it than an alligator. City folks got so they simply toted loaves of bread into the country and got the filler for their chicken sandwiches like Sherman and Coxy's Army. They busted down those sacred old rail fences and trampled the grapes in the vineyard. They uprooted the pumpkins and picked the vines clean of cabbage. They were so discriminating that they selected Guernsey herds to milk on account of the higher cream line. But thanks to our watchful solons a man who

climbs through a wire fence nowadays must prove no intention of mayhem, grand larceny, or malfeasance in office or spend the night in the hoosegow.

A few picnics ending like that will teach city folks to be as self-reliant as they advise farmers to be. It removes one of the public drawbacks to the picnic fever, but there is one more left to eradicate.

THIS is the litter habit. Too many vernal landscapes on Sunday evening look like paper hangers had been working in the cow pasture. Appearances are bad enough, but results are sometimes worse. In our state when the spring fishing season begins it is the signal for tremendous forest fires. I sometimes think there are more suckers and bullheads on land than in the waters beneath. Our schools should teach the rising generation that scenery and outdoor virtues are public trusts. We must see to it that conservation becomes something more than conversation. If we can't agree to that doctrine to protect the native beauty of the wild, then let's build another rock garden in the back yard and fry our fritters at home.

People who frequently picnic will agree that our landscape needs friends. My state has an organization with that laudable title. Maybe when your state gets up enough ambition they will organize one also. Some landscapes never had any friends, such as the coal fields of Illinois and Pennsylvania and part of the Bad Lands in Dakota. Other beauty spots held out warm, inviting arms to the weary newcomer. Appreciative folks drank in the scenery without an orgy, and returned refreshed and charmed for another week in the tread mill. A minority played false to the friendly fields. They scattered egg shells and paper boxes, broke down shrubs and hogged up the scarcest wild flowers. Not content with that they had a commercial zeal to advertise their week-day wares to others who might come that way; so flamboyant signs and gaudy daubs besmirched the fences and insulted the rocks and trees. If this keeps up much longer we may have to install a state commission to regulate picnics. Why not? It's right in line with modern necessity, as half our regulatory laws are enacted to protect ourselves from ourselves.

As I said before, the picnic was probably discovered for America by the hardy immigrants from northern Europe. If you have been so unfortunate as never to have beheld a real Turnverein or Nordskylag picnic you don't know the meaning of social community recreation. With the diminishing use of lager, alcohol and snoose this type of picnic may not carry quite the local color it once possessed. But as a stimulant to patriotism and appetite nothing in my state equals it except a thresherman's barbeque. It takes an All-American linesman to hold his own in the lunch gang on such occasions. We actually need more of the old cave-days fighting ability at grub time anyhow. Too many of us have it served on card tables where one false move will spill the whole works. We are too feminine.

SERIOUSLY, however, I claim that these picnics invented by the hardy pioneer immigrant settlers of my native state were incubators of fervor for the new land and its golden opportunity. Men and women worked hard all the year and met on such occasions to give vent to their stifled ardor for the communism that is built on federated independence.

Begun perhaps as a family affair, the picnic had soon branched out to take in the whole countryside for one joyous outdoor hurrah. Lately the college of agriculture has been trying to re-create such settings, minus the blind staggers. They have found that those one-time well knit communities are distracted and torn asunder with modernity and complexity. Their aim has been to revive some of the

traditions and customs which helped to make the original citizens of the west a band of progress. But somehow thus far we haven't quite succeeded in this any more than we have saved the country church from cobwebs. The people who attend *will* talk about such mundane things as tires, mileage, and chain stores, and so very little at all about ideals, hopes and patriotism. The public picnic, like the old gray mare, isn't what she used to be; even though you search far and wide for hot contests and warm speakers.

Need I discuss that form of chaperoned carnival known as the Sunday school picnic? In some parts of the country I believe it has declined in popularity along with the livery stable and the hay rack. When you stop to think of those excursions we had as youngsters you must admit that it was the rides to and fro that furnished most of the fun; and so now we are denied that anticipation because it only takes a few whizzes and a bump to land us at Brown's glen. The promise of a picnic stimulated Sabbath school regularity in the doldrums of summer time, just as the sanctity of juveniles became alarmingly unreal early in December.

IN one respect I declare that the athletic events of the scholastic picnics have improved since my junior era. It is in the way the leaders participate in the jumps and races. Formerly the teachers wore trailing skirts and tight waists and their long locks of hair had to stay piled neatly with a gross of pins. The ministers and superintendents came in frock coats, or were bound up in the garb of dignity. When you find a school picnic party now it is hard to tell the sheep from the shepherdess or the goat from the bell wether. You find out that people over fifteen years of both sexes have legs that can run and bare arms that can swing and punch. Everyone is trying to remain young and active, thereby retaining a certain form of religion that does as much for the human form and spirit as the corset and commandments sought to do of yore.

To picnic where your parents picnicked in those far-off golden days is probably a joy akin to provincialism and local clannishness. But somehow I cannot force myself to become a "citizen of the world at large" or graft on my ego the breadth of vision which venerates the Chinese joss house along with the old homestead at Hardscrabble. Sometimes I hope for a broader outlook that would cause me to admire the jungle flora the same way I take in the beauty of old lilacs at the ruins of grandfather's cabin.

BE as it may with me, I am honest in my conviction that to take our family lunches into that quiet old gorge in the hills where Father and Mother skipped across the self-same stones in the twinkling little brook is the last word in nature communion. I sit there with my family around me. The soft rustling of the leaves and the murmur of the stream brings to me, as little else can, the old truth that nature and the forces of earth move surely and silently on while men are but the actors of a one-night stand in the dramas taking place on this scenic stage. Sometimes I sort of feel as though unseen hands were stretched in welcome from the past generation to this one, in a fellowship of place and purpose; not in a haunting, dreadful way, but with serene and majestic benediction.

And so I have come to appreciate picnics from many angles, not the greatest of which is the commissary. I know it is the same with you. A picnic, like every other form of recreation, is just what you make of it. Whether you have ambitions for simple picnics or sublimated festivals, there are three things you mustn't forget—moderation, mustard and marshmallows.

UNIMAGINATIVE

Two miners who had been brought up in the same village, but had long since drifted apart, met the other day. "Hello, Tom! Let's 'ave a drink," said one.

"No, Jack," replied the other, who had recently come under the influence of a revival mission, "I 'ave been born again."

"What!" exclaimed Jack, looking down at the other's legs. "Born again, an' still bow-legged?"

Judge—"Now, I don't expect to see you here again, Rastus."

Rastus—"Not see me here again, Jedge? Why, you all ain't going to resign yo' job, is you, Jedge?"

"Abie, how's business?"

"Oi, terrible! Even dose vot don't pay ain't buying nothing!"

A little boy was sitting behind a baldheaded man in church, who was scratching the fringe of hair on one side of his bald pate. The old gentleman kept it up so long that the little boy became interested, and leaning over said, "Say, mister, you'll never catch him there. Why don't you run him out in the open?"

Lady: "But don't you find that horseback riding gives one a headache?"

Instructor: "No, madam, just the reverse."

APOLOGY PENDING

The ladies of the Helping Hand Society enjoyed a swap social on Friday evening. Everybody brought something they didn't need. Many of the ladies were accompanied by their husbands.—*Opelike (Ala.) Star.*

He: "My ancestors came over in the Mayflower."

She: "It's lucky they did. The immigration laws are a little stricter now."—Exchange.

Mr. Smith was seeing a friend off to Denver.

"Be sure," he said, "to look up my friend, Mr. Lummac, while in the city. Lummac—you can remember his name as it rhymes with stomach."

A few days later his friend returned and encountered Smith on the street.

"Do you know," he said, "I tried and tried, but I never could find that Mr. Kelly."—*Baptist Observer.*

Timothy Hay: "How did you like Venice, Uncle Eli?"

Eli: "I don't know. I only stayed there over night. The whole place was flooded."

A Scotchman had lost his wallet and had it returned to him by the police three days later. He was asked to examine the contents to see if his money was all there.

"Aye, the money's there a'richt, but, mon, ye've it three days—what about the interest?"

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